Appendixes A, B, C, and D

Environmental Impact Statement for Proposed Demolition and Environmental Cleanup Activities at Santa Susana Field Laboratory, Ventura County, California

Prepared for

National Aeronautics and Space Administration

July 2013

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Contents

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APPENDIX A

Council on Environmental Quality Letter, June 19, 2012

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EXECUTIVE OFFICE OF THE PRESIDENT
COUNCIL ON ENVIRONMENTAL QUALITY
WASHINGTON, D.C. 20503

June 19, 2012

The Honorable Barbara Boxer
Chairman
Committee on Environment and Public Works
United States Senate
Washington, D.C. 20510-6175

Dear Chairman Boxer:

Thank you for your May 2, 2012 letter inquiring about the alternatives that the National Aeronautics and Space Administration (NASA) must consider for the cleanup of the Santa Susana Field Laboratory Site under the National Environmental Policy Act (NEPA) based on the existing Administrative Order on Consent, signed on December 6, 2010 (the Agreement). Your letter also asks for the views of the Council on Environmental Quality (CEQ) on how NASA and the State of California (State) can cooperate and move forward with the cleanup process. In the specific situation of NASA's cleanup of the Santa Susana site, NASA has committed under the Agreement to perform a cleanup of chemical and/or radiological contaminants in or on soils at the site to local background levels. NASA's current range of alternatives includes various other cleanup standards that do not clean up to background.

NEPA anticipates full disclosure to the public and the decision maker of the environmental effects of a project and its reasonable alternatives before a decision is made. CEQ oversees implementation of NEPA, principally through issuance and interpretation of NEPA regulations that implement the requirements of NEPA. The Supreme Court has long recognized that CEQ's interpretation of NEPA and its regulations is entitled to substantial deference. See Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 355-56 (1989); Andrus v. Sierra Club, 442 U.S. 347, 358 (1979). The CEQ regulations direct agencies first to identify the project's purpose and need and set forth the alternatives that flow from that purpose and need. 40 C.F.R. § 1502.13. The agencies should then rigorously explore and evaluate objectively all reasonable alternatives, including reasonable alternatives that may not be "within the jurisdiction of the lead agency." 40 C.F.R. § 1502.14(c).

CEQ encourages agencies to carry out robust alternatives analyses that consider all reasonable alternatives, including those that are not within agencies' authorities. The real focus, however, must always be on a meaningful consideration of alternatives. In this particular situation, where NASA has signed the Agreement and committed to a cleanup standard to background, nothing under NEPA or CEQ regulations constrains NASA from looking beyond cleanup to background, even though some may consider the analysis unnecessary and inconsistent with the agreement NASA signed with the State. However, there is no requirement that NASA consider alternatives that cleanup to other standards that differ from the agreement with the State. The Supreme Court has stated that the concept of alternatives must be bounded by some notion of feasibility, Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 551 (1978), and under the specific facts of the cleanup at this time, feasibility is most sufficiently defined within the scope of cleanup to background. There would, of course, have to be a no-action alternative considered.

Indeed, as the Supreme Court has stated, "inherent in NEPA and its implementing regulations is a 'rule of reason,' which ensures that agencies determine whether and to what extent to prepare an [Environmental Impact Statement] based on the usefulness of any new potential information to the decisionmaking process." Department of Transportation v. Public Citizen, 541 U.S. 752, 767 (2004) (citing Marsh v. Oregon Natural Resources Council, 490 U.S. 360, 373-374 (1989)). This "rule of reason" applies equally to the identification of the purpose and need statement and the alternatives, which NASA must consider in the context of the Agreement. In view of NASA's administrative cleanup resolution with the State of California, which turns upon NASA's commitment to clean the site to local background levels, CEQ's view is that — under this rule of reason — NASA is not compelled to consider less comprehensive cleanup measures as alternatives.

As to assisting the State and NASA in moving forward cooperatively, it is fully consistent with CEQ regulations for NASA and the State to coordinate their environmental reviews to the greatest extent possible. CEQ would recommend such coordination while allowing NASA to retain the integrity of its NEPA decision making authority. CEQ would propose that the State and NASA conduct face-to-face meetings with the goal of establishing an updated cleanup timetable. During the process of working on a timetable, the State and NASA will also be able to resolve other issues, including: (1) what information, including any site characterization information, NASA and the State can provide each other to facilitate NASA's NEPA process and the State's California Environmental Quality Act (CEQA) work; (2) how the NEPA and CEQA processes will work together; (3) what the State's timeline is for the CEQA process; and (4) whether an extension for completion of the cleanup could assist in facilitating coordination among the NASA and State efforts. CEQ would be pleased to assist NASA, the State, and the Committee as appropriate in fostering this coordination.

Thank you again for your letter. CEQ shares your commitment to ensuring that the Santa Susana Field Laboratory Site is cleaned up to background pursuant to the Agreement and that its lands be enjoyed by current and future residents of the area.

Sincerely,

Nancy H. Sutley
Chair

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APPENDIX B

Applicable Laws and Regulations

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TABLE B-1
Regulatory Framework Summary for Santa Susanna Field Laboratory EIS
NASA SSFL EIS for Proposed Demolition and Environmental Cleanup

Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
General Regulatory Setting				
National Environmental Policy Act (NEPA) of 1969	Requirement of any federal to consider the environmental impacts of their proposed actions and the reasonable alternatives to those actions.	42 United States Code (U.S.C.) §4321 et seq.; Public Law 91-190	Council on Environmental Quality All federal agencies (for Santa Susanna Field Laboratory, U. S. National Aeronautics and Space Administration)	http://ceq.hss.doe.gov/nepa/regs/nepa/nepaeqia.htm http://www.nasa.gov/agency/nepa/itm_NEPAProgram.html
Cultural Regulatory Setting				
National Historic Preservation Act (NHPA) of 1966	Requires federal agencies to consider the potential effects of their proposed actions on historic properties. Also referred to as Section 106 consultation.	16 U.S.C. § 470 et seq., as amended; Public Law 89-665	U. S Department of Interior Advisory Council on Historic Preservation State Historic Preservation Office	http://www.achp.gov/nhpa.html
Archeological and Historic Preservation Act (AHPA)	Federal agencies provide for the preservation of historical and archeological data (including relics and specimens) which might otherwise be irreparably lost or destroyed as the result of any alteration of the terrain caused as a result of any federal construction project of federally licensed activity or program.	16 U.S.C. §§ 469-469c; Public Law 93-291	U. S Department of Interior Advisory Council on Historic Preservation State Historic Preservation Office	http://www.nps.gov/archeology/tools/Laws/AHPA.htm
Archaeological Resources Protection Act (ARPA) of 1979	Requirements that must be met before federal authorities can issue a permit to excavate or remove any archeological resource on federal or Indian lands.	16 U.S.C. §§ 470aa – mm; Public Law 96-95	U. S Department of Interior Advisory Council on Historic Preservation State Historic Preservation Office	http://www.nps.gov/archeology/tools/Laws/arpa.htm

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The Native American Graves Protection and Repatriation Act (NAGPRA)	Requires federal agencies inventory holdings of Native American human remains and funerary objects and provide written summaries of other cultural items and provide greater protection for Native American burial sites and more careful control over the removal of Native American human remains, funerary objects, sacred objects, and items of cultural patrimony on federal and tribal lands.	25 U.S.C. §§ 3001-3013; Public Law 101-601	U. S Department of Interior Advisory Council on Historic Preservation State Historic Preservation Office	http://www.nps.gov/archeology/tools/Laws/NAGPRA.htm
Biological Regulatory Setting				
Federal Endangered Species Act (ESA) of 1973	Requires federal agencies to avoid actions that might jeopardize the existence of threatened or endangered species, or destroy or adversely affect critical habitats of such species.	16 U.S.C. §§ 1531-1544, 87 Stat. 884, as amended	U. S. Fish and Wildlife Service National Oceanic Atmospheric Administration [although not applicable for Santa Susanna Field Laboratory, applicable for marine mammals]	http://www.fws.gov/laws/lawsdigest/ESACT.HTML http://www.fws.gov/endangered/esa-library/index.html#esa
Migratory Bird Treaty Act (MBTA) of 1918	Requires federal agencies to support migratory bird conservation.	16 U.S.C. §§ 703-712, as amended	U. S. Fish and Wildlife Service	http://www.fws.gov/laws/lawsdigest/migtrea.html http://law2.house.gov/uscode-cgi/fastweb.exe?getdoc+uscview+t13t16+6189+0++%28%29%20%20AND%20%28%2816%29%20ADJ%20USC%29%3ACITE%20AND%20%28USC%20w%2F10%20%28703%29%29%3ACITE%20%20%20%20%20%20%20%20%20
Executive Order 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds)	Requires federal agencies to support migratory bird conservation.	66 *Federal Register* 3853	U. S. Fish and Wildlife Service Council on Environmental Quality	http://ceq.hss.doe.gov/nepa/regs/eos/eo13186.html

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Bald and Golden Eagle Protection Act of 1940	Prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles (*Haliaeetus leucocephalus)* or golden eagles (*Aquila chrysaetos)*, including their parts, nests, or eggs.	16 U.S.C. §§ 668-668c, 54 Stat. 250, as amended; 50 CFR 22	U. S. Fish and Wildlife Service	http://www.fws.gov/laws/lawsdigest/BALDEGL.HTML http://www.fws.gov/midwest/MidwestBird/EaglePermits/index.html
Conservation Programs on Government Lands (Sikes Act) [Integrated Natural Resource Management Plan]	Authorized conservation and rehabilitation programs on NASA and other federal lands.	16 U.S.C. §§ 670a-670o, 74 Stat. 1052, as amended; Public Law 93-452	U. S. Fish and Wildlife Service	http://www.fws.gov/laws/lawsdigest/SIKES.HTML http://www.fws.gov/habitatconservation/sikes_act.html
Federal Noxious Weed Act of 1975	Requires federal agencies to control the spread of noxious weeds.	7 U.S.C. § 2801 et seq.; 88 Stat. 2148; Public Law 93-629	U. S. Fish and Wildlife Service Bureau of Land Management U.S Department of Agriculture	http://www.fws.gov/laws/lawsdigest/fednox.html http://www.thecre.com/fedlaw/legal2/fedweed.htm http://www.blm.gov/wo/st/en/prog/more/weeds/blm_program.html
Executive Order 13112	Prepare and issue the first edition of a National Invasive Species Management Plan, detailing and recommending performance-oriented goals and objectives and specific measures of success for federal agency efforts concerning invasive species.	64 *Federal Register* 6183	U.S Department of Agriculture Council on Environmental Quality	http://www.invasivespeciesinfo.gov/laws/execorder.shtml

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Federal Water Pollution Control Act (Clean Water Act) (CWA)	Regulation to protect surface waters and waterways	33 U.S.C. §§ 1251 - 1376; Chapter 758; P.L. 845, as amended 40 Code of Federal Regulations (CFR) Part 100 - 149	California Department of Environmental Protection State Water Resources Control Board Regional Water Quality Control Boards U.S. Environmental Protection Agency	http://www.swrcb.ca.gov/water_issues/programs/#wqassessment http://www.epa.gov/npdes/pubs/cwatxt.txt http://www.access.gpo.gov/nara/cfr/waisidx_03/40cfrv19_03.html http://www.access.gpo.gov/nara/cfr/waisidx_03/40cfrv20_03.html
California Endangered Species Act (CESA) of 1948	Law requiring the California Department of Fish and Game to work with all interested persons, agencies, and organizations to protect and preserve sensitive species and their habitats.	Fish and Game Code, Sections 2050 et seq.	California Department of Environmental Protection California Department of Fish and Game	http://www.dfg.ca.gov/habcon/cesa/ http://www.leginfo.ca.gov/cgi-bin/displaycode?section=fgc&group=02001-03000&file=2050-2069 http://www.leginfo.ca.gov/cgi-bin/displaycode?section=fgc&group=02001-03000&file=2070-2079 http://www.leginfo.ca.gov/cgi-bin/displaycode?section=fgc&group=02001-03000&file=2080-2085
California Native Plant Protection Act (NPPA) of 1977	Law intended to preserve, protect, and enhance the endangered and rare plants of California.	Fish and Game Code Section 1900-1913	California Department of Environmental Protection California Department of Fish and Game	http://www.dfg.ca.gov/wildlife/nongame/t_e_spp/nat_plnt_consv.html http://www.leginfo.ca.gov/cgi-bin/displaycode?section=fgc&group=01001-02000&file=1900-1913
California Fish and Game Code	Regulates the taking or possession of birds, mammals, fish, amphibian, and reptiles.	California Law; Fish and Game Code, Divisions 0.5-13.5	California Department of Environmental Protection California Department of Fish and Game	http://www.leginfo.ca.gov/calaw.html http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=fgc&codebody=&hits=20

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Air Quality and Greenhouse Gas Setting				
The Clean Air Act (CAA) of	Authorized the development of comprehensive federal and state regulations to limit emissions from both stationary (industrial) sources and mobile sources.	42 U.S.C. §7401 et seq., as amended 40 CFR Part 68	U.S. Environmental Protection Agency	http://www.epa.gov/air/caa/
Greenhouse Gas (GHG) Reporting Program	Requires reporting of GHG data and other relevant information from large sources and suppliers in the United States.	40 CFR Part 98	U.S. Environmental Protection Agency	http://www.epa.gov/climatechange/emissions/ghgrulemaking.html
Ventura County Air Pollution Control District (VCAPCD)	Address fugitive dust on public and private roads, demolition and renovation, and soil decontamination, and enforcement of the General Conformity Rule to the VCAPCD.	Rules of the Ventura County Air Pollution Control District, Regulations I-XII	Ventura County Air Pollution Control Board	http://www.vcapcd.org/ http://www.vcapcd.org/Rulebook/RuleIndex.htm http://www.vcapcd.org/Rulebook/Rule4.htm http://www.vcapcd.org/Rulebook/RuleX.htm
South Coast Air Quality Management District (SCAQMD)	Rules that pertain to the proposed action, including those that address fugitive dust, and enforcement of the General Conformity Rule at the local level.	Air Quality Management District (AQMD) Regulations I-XXXV, Rules 101-3503	Air Quality Management District (AQMD) Governing Board	http://www.aqmd.gov/ http://www.aqmd.gov/rules/index.html http://www.aqmd.gov/rules/rulesreg.html
San Joaquin Valley Air Pollution Control District (SJVAPCD)	Rules that pertain to the proposed action, including those that address fugitive dust, and enforcement of the General Conformity Rule at the local level.	Rules and Regulations of the San Joaquin Valley Unified Air Pollution Control District, Regulations I-IX	Valley Air District Governing Board	http://www.valleyair.org/Home.htm
Water Regulatory Setting				

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Federal Water Pollution Control Act (Clean Water Act) (CWA)	Regulation to protect surface waters and waterways	33 U.S.C. §§ 1251 - 1376; Chapter 758; P.L. 845, as amended 40 CFR Part 100 - 149	California Department of Environmental Protection State Water Resources Control Board Regional Water Quality Control Boards U.S. Environmental Protection Agency	http://www.swrcb.ca.gov/water_issues/programs/#wqassessment http://www.epa.gov/npdes/pubs/cwatxt.txt http://www.access.gpo.gov/nara/cfr/waisidx_03/40cfrv19_03.html http://www.access.gpo.gov/nara/cfr/waisidx_03/40cfrv20_03.html
National Pollutant Discharge Elimination System (NPDES), CWA Section 402	Regulation of stormwater discharges from construction and disturbed land activities; regulates stormwater from construction activity; general permit for minimizing sediment and pollutant loading in stormwater discharging offsite.	33 U.S.C. § 1342, as amended 40 CFR Part 100 - 149	California Department of Environmental Protection State Water Resources Control Board Regional Water Quality Control Boards U.S. Environmental Protection Agency	http://www.waterboards.ca.gov/water_issues/programs/npdes/#process http://www.epa.gov/npdes/pubs/cwatxt.txt http://www.access.gpo.gov/nara/cfr/waisidx_03/40cfrv19_03.html http://www.access.gpo.gov/nara/cfr/waisidx_03/40cfrv20_03.html
Water Quality Certification, CWA 401	State certification process for discharge to waters of the United States that the discharge complies with other provisions of the CWA.	33 U.S.C. § 1341, as amended 40 CFR Part 100 - 149	California Department of Environmental Protection State Water Resources Control Board Regional Water Quality Control Boards U.S. Environmental Protection Agency	http://www.waterboards.ca.gov/water_issues/programs/npdes/#process http://www.epa.gov/npdes/pubs/cwatxt.txt http://www.access.gpo.gov/nara/cfr/waisidx_03/40cfrv19_03.html http://www.access.gpo.gov/nara/cfr/waisidx_03/40cfrv20_03.html
Water Quality Impairments, CWA 303d [Identification of Areas with Insufficient Controls; Maximum Daily Load; Certain Effluent Limitations Revision]	Requires each state to provide a list of impaired waters that do not meet or are expected not to meet state water quality standards.	33 U.S.C. § 1313, as amended 40 CFR Part 100 - 149	California Department of Environmental Protection State Water Resources Control Board Regional Water Quality Control Boards U.S. Environmental Protection Agency	http://www.waterboards.ca.gov/water_issues/programs/npdes/#process http://www.epa.gov/npdes/pubs/cwatxt.txt http://www.access.gpo.gov/nara/cfr/waisidx_03/40cfrv19_03.html http://www.access.gpo.gov/nara/cfr/waisidx_03/40cfrv20_03.html

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Hazardous Waste Control	State regulatory information for managing hazardous waste (generators; transporters; facilities permitted with RCRA or standardized permits; and other authorizations and notifications).	California Code of Regulations, Title 22, Division 4.5 Environmental Health Standards for the Management of Hazardous Waste	California Department of Environmental Protection California Department of Toxic Substances Control U.S. Environmental Protection Agency	http://www.dtsc.ca.gov/ http://www.dtsc.ca.gov/HazardousWaste/index.cfm http://dtsc.ca.gov/SiteCleanup/Santa_Susana_Field_Lab/index.cfm http://weblinks.westlaw.com/toc/default.aspx?Abbr=ca%2Dadc&Action=CollapseTree&AP=IE6E81020D4B911DE8879F88E8B0DAAAE&ItemKey=IE6E81020D4B911DE8879F88E8B0DAAAE&RP=%2Ftoc%2Fdefault%2Ewl&Service=TOC&RS=WEBL12.01&VR=2.0&SPa=CCR-1000&pbc=DA010192&fragment#IE6E81020D4B911DE8879F88E8B0DAAAE
Porter-Cologne Water Quality Act	Established Regional Water Quality Control Boards throughout the state and requires projects that are discharging, or proposing to discharge, wastes that could affect the quality of the state's water to file a Report of Waste Discharge with the appropriate Regional Water Quality Control Boards.	California Law; Water Code Section 13000 et seq., Division 7, Chapter 4-10	California Department of Environmental Protection California Department of Toxic Substances Control	http://www.swrcb.ca.gov/laws_regulations/ http://www.leginfo.ca.gov/calaw.html http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=wat&codebody=&hits=20
California Water Code Section 13751	Requires that anyone who constructs, alters, or destroys a water well, cathodic protection well, groundwater monitoring well, or geothermal heat exchange well file a well completion report with the Department of Water Resources.	California Law; Water Code, Division 7, Chapter 10	California Department of Environmental Protection California Department of Toxic Substances Control	http://www.leginfo.ca.gov/calaw.html http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=wat&codebody=&hits=20 http://www.leginfo.ca.gov/cgi-bin/displaycode?section=wat&group=13001-14000&file=13750.5-13755

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Basin Plans and Water Quality Objectives	Adopts water quality control plans, or basin plans, that establish water quality objectives to provide reasonable protection of beneficial uses and an implementation program for achieving water quality objectives within the basin plans.	California Code of Regulations, Title 23, Division 3-5	California Department of Environmental Protection State Water Resources Control Board Regional Water Quality Control Boards U.S. Environmental Protection Agency	http://www.swrcb.ca.gov/plans_policies/ http://www.waterboards.ca.gov/losangeles/water_issues/programs/basin_plan/
Dewatering Activities	Removal of nuisance water from a construction site because of the high turbidity and other pollutants potentially associated with this activity. Water Quality Construction Best Management Practices Manual.	California Law; Water Code Section 13000 et seq., Division 7, Chapter 1-10 33 U.S.C. § 1342, as amended 40 CFR Part 100 - 149	California Department of Environmental Protection State Water Resources Control Board Regional Water Quality Control Boards U.S. Environmental Protection Agency	http://www.swrcb.ca.gov/laws_regulations/ http://www.leginfo.ca.gov/calaw.html http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=wat&codebody=&hits=20 http://www.waterboards.ca.gov/water_issues/programs/stormwater/constpermits.shtml
Stormwater Management Programs	Regulation of stormwater discharges from construction and disturbed land activities; regulates stormwater from construction activity; general permit for minimizing sediment and pollutant loading in stormwater discharging offsite.	California Law; Water Code Section 13000 et seq., Division 7, Chapter 6-10 33 U.S.C. § 1342, as amended 40 CFR Part 100 - 149	California Department of Environmental Protection State Water Resources Control Board Regional Water Quality Control Boards U.S. Environmental Protection Agency	http://www.waterboards.ca.gov/water_issues/programs/npdes/#process http://www.epa.gov/npdes/pubs/cwatxt.txt http://www.access.gpo.gov/nara/cfr/waisidx_03/40cfrv19_03.html http://www.access.gpo.gov/nara/cfr/waisidx_03/40cfrv20_03.html
Geology Regulatory Setting				
Historic Sites Act of 1935	Establishes a national registry of natural landmarks and protects outstanding examples of major geological features. Also serves to protect fossils as prehistoric structures and objects of scientific interest.	16 U.S.C. §§ 461-467; Public Law 74-292	U. S Department of Interior Advisory Council on Historic Preservation State Historic Preservation Office	http://www.blm.gov/heritage/docum/histsite.pdf

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Federal Land Policy and Management Act (FLPMA) of 1976	Charges federal agencies to manage public lands in a manner that protects the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, archaeological, and water resources and, where appropriate, to preserve and protect certain public lands in their natural condition; to periodically inventory public lands so that the data can be used to make informed land-use decisions; and to regulate the use and development of public lands and resources through easements, licenses, and permits.	Public Law 94-579	U.S. Department of Interior Bureau of Land Management	http://www.blm.gov/flpma/
National Historic Preservation Act (NHPA) of 1966	Provides for the survey, recovery, and preservation of significant paleontological data when such data might be destroyed or lost due to a federal, federally licensed, or federally funded project.	16 U.S.C. § 470 et seq., as amended; Public Law 89-665	U. S Department of Interior Advisory Council on Historic Preservation State Historic Preservation Office	http://www.achp.gov/nhpa.html
Regulations Relating to Public Lands	Prohibits the collection of scientific resources, including vertebrate fossils, without a permit, as well as the use of fossils found on federal land for commercial purposes.	43 CFR 8365.1-5	U.S. Department of Interior Bureau of Land Management	http://www.gpo.gov/fdsys/search/pagedetails.action;jsessionid=qCHDTYQchPNLSv20nCy6HXv1hLTh1Kv7JQkKCdr0GFdyzRyhbbvJ!1708642603!-1894506425?st=Nonrenewable&collection=CFR&historical=false&granuleId=CFR-2010-title43-vol2-sec8365-1-5&packageId=CFR-2010-title43-vol2
Omnibus Public Land Management Act (OPLMA), Paleontological Resources Preservation Act (PRPA) of 2009	Management and protection of paleontological resources on federal land using scientific principles and expertise.	16 U.S.C. § 470aaa; Public Law 111-011	U.S. Department of Interior U.S. Department of Agriculture	http://www.blm.gov/wo/st/en/prog/more/CRM/paleontology/paleontological_regulations.html#Omnibus http://www.blm.gov/wo/st/en/prog/more/CRM/paleontology/fossil_collecting.html

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Potential Fossil Yield Classification (PFYC) System for Paleontological Resources on Public Lands	System used to classify paleontological resource potential on public lands in order to assess possible resource impacts and mitigation needs for federal actions involving surface disturbance, land tenure adjustments, and land-use planning. Implementation of the PFYC system will not mandate changes to existing land use plans, project plans, or other completed efforts. Integration into plans presently being developed is discretionary.	Instruction Memorandum No. 2008-009	U.S. Department of Interior Bureau of Land Management	http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/20080/im_2008-009.html
Hazardous Materials and Waste Regulatory Settings				
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)	Known as Superfund. Provides broad federal authority to respond to directly to releases or threatened releases of hazardous substances.	42 U.S.C. §9601 et seq., as amended	U.S. Environmental Protection Agency	http://www.epa.gov/superfund/policy/cercla.htm
The Clean Air Act (CAA) of 1970	Authorized the development of comprehensive federal and state regulations to limit emissions from both stationary (industrial) sources and mobile sources.	42 U.S.C. §7401 et seq., as amended 40 CFR Part 68	U.S. Environmental Protection Agency	http://www.epa.gov/air/caa/
Atomic Energy Act of 1954	Radioactive materials and wastes regulate by U.S. Nuclear Regulatory Commission.	42 U.S.C. § 2014(e), as amended; Public Law 83-703 NUREG-0980, Volume 1, Number 9	U.S. Nuclear Regulatory Commission	http://www.nrc.gov/about-nrc/governing-laws.html#aea-1954 http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0980/v1/
Low-level Radioactive Waste Policy Amendments Act of 1985	U.S. Nuclear Regulatory Commission delegated authority for low-level radioactive materials and waste to Department of Health Services.	42 USC 2021b et seq., as amended; Public Law 99-240 NUREG-0980, Volume 1, Number 9	U.S. Nuclear Regulatory Commission California Department of Environmental Protection	http://www.nrc.gov/about-nrc/governing-laws.html#llrwpaa-1985 http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr0980/v1/

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Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
Health and Safety Code	Department of Health Services regulates handling and use of ionizing radiation.	California Law; Health and Safety Code, Division 1-120	California State Department of Health Services	http://www.leginfo.ca.gov/calaw.html http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=hsc&codebody=&hits=20
Federal Water Pollution Control Act (Clean Water Act) (CWA)	Regulation to protect surface waters and waterways.	33 U.S.C. §§ 1251 - 1376; Chapter 758; P.L. 845, as amended 40 CFR Part 100 - 149	California Department of Environmental Protection State Water Resources Control Board Regional Water Quality Control Boards U.S. Environmental Protection Agency	http://www.swrcb.ca.gov/water_issues/programs/#wqassessment http://www.epa.gov/npdes/pubs/cwatxt.txt http://www.access.gpo.gov/nara/cfr/waisidx_03/40cfrv19_03.html http://www.access.gpo.gov/nara/cfr/waisidx_03/40cfrv20_03.html
National Toxics Rule	Sets chemical-specific, numeric water quality criteria for priority toxic pollutants to bring states into compliance with the requirements of Section 303(c)(2)(B) of CWA.	CWA Section 303(c)(2)(B) 40 CFR Part 131	U.S. Environmental Protection Agency	http://water.epa.gov/lawsregs/rulesregs/ntr.cfm
California Toxic Rule	Sets numeric water quality criteria for priority toxic pollutants and other water quality standards provisions to be applied to waters in the State of California.	CWA Section 303(c)(2)(B); section 304(a); and section 307(a)	California Department of Environmental Protection California Department of Toxic Substances Control U.S. Environmental Protection Agency	http://water.epa.gov/lawsregs/rulesregs/ctr/
Spill Prevention, Control, and Countermeasure Rule (SPCC)	Designed to prevent or contain discharge or threat of discharge of oil. Facilities are required to prepare a written SPCC Plan for oil storage above a certain threshold.	40 CFR 112	California Department of Environmental Protection Ventura County Environmental Health Division U.S. Environmental Protection Agency	http://www.calepa.ca.gov/cupa/aboveground/ http://www.ventura.org/rma/envhealth/programs/cupa/apstp.html

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Regulatory Framework Summary for Santa Susanna Field Laboratory EIS
NASA SSFL EIS for Proposed Demolition and Environmental Cleanup

Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
National Pollutant Discharge Elimination System (NPDES), CWA Section 402	Regulation of stormwater discharges from construction and disturbed land activities; regulates stormwater from construction activity; general permit for minimizing sediment and pollutant loading in stormwater discharging offsite.	33 U.S.C. § 1342, as amended 40 CFR Part 100 - 149	California Department of Environmental Protection State Water Resources Control Board Regional Water Quality Control Boards U.S. Environmental Protection Agency	http://www.waterboards.ca.gov/water_issues/programs/npdes/#process http://www.epa.gov/npdes/pubs/cwatxt.txt http://www.access.gpo.gov/nara/cfr/waisidx_03/40cfrv19_03.html http://www.access.gpo.gov/nara/cfr/waisidx_03/40cfrv20_03.html
Resource Conservation and Recovery Act (RCRA)	Primary law governing hazardous waste generation, transport, and treatment/disposal.	42 U.S.C § 6901 et seq., as amended	California Department of Environmental Protection California Department of Toxic Substances Control U.S. Environmental Protection Agency	http://www.dtsc.ca.gov/ http://www.dtsc.ca.gov/HazardousWaste/index.cfm http://www.epa.gov/compliance/civil/rcra/rcraenfstatreq.html
Occupational Safety and Health Standards (OSHA)	Requirements for equipment for protecting worker health and safety used to store and handle hazardous materials	California Code of Regulations, Title 8 29 CFR 1910 et seq. and 29 CFR 1926 et seq.	California Department of Industrial Relations U.S. Department of Labor	https://www.dir.ca.gov/counters/t8index.htm http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=7e2f86cc16e34deca036ee4258c5ff0c&tpl=/ecfrbrowse/Title29/29cfr1910a_main_02.tpl http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div5&view=text&node=29:8.1.1.1.1&idno=29

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Regulatory Framework Summary for Santa Susanna Field Laboratory EIS
NASA SSFL EIS for Proposed Demolition and Environmental Cleanup

Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
Hazardous Materials Regulations	Regulations covering all aspects of hazardous materials packaging, handling, and transportation.	49 CFR Parts 172, 173, 177, 178, 179, and 180	U.S. Department of Transportation	http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title49/49cfr172_main_02.tpl http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title49/49cfr173_main_02.tpl http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title49/49cfr177_main_02.tpl http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title49/49cfr178_main_02.tpl http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title49/49cfr179_main_02.tpl http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title49/49cfr180_main_02.tpl
California Water Code	Addresses compliance with the provisions of the federal CWA and waste discharge requirements.	California Law; Water Code, Division 7, Chapters 4 and 5.5	California Department of Environmental Protection State Water Resources Control Board Regional Water Quality Control Boards U.S. Environmental Protection Agency	http://www.leginfo.ca.gov/calaw.html http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=wat&codebody=&hits=20 http://www.leginfo.ca.gov/cgi-bin/displaycode?section=wat&group=13001-14000&file=13260-13275 http://www.leginfo.ca.gov/cgi-bin/displaycode?section=wat&group=13001-14000&file=13370-13389

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Regulatory Framework Summary for Santa Susanna Field Laboratory EIS
NASA SSFL EIS for Proposed Demolition and Environmental Cleanup

Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
California Hazard Communication Regulation	California Code of regulations that lists hazardous chemicals relating to the Hazardous Substance Information and Training Act; addresses control of hazardous substances; and addresses hot, flammable, poisonous, corrosive, and irritant substances.	California Code of Regulations, Title 8, Section 339, Section 3200 et seq., Section 5139 et seq., and Section 5160 et seq.	California Department of Environmental Protection California Department of Toxic Substances Control U.S. Environmental Protection Agency	https://www.dir.ca.gov/title8/339.html https://www.dir.ca.gov/Title8/sub7.html
Health and Safety Code	Basic hazardous waste law for California	California Law; Health and Safety Code, Division 20, Chapter 6.5, Section 253000, Section 25500, and Section 25531	California Department of Environmental Protection California Department of Toxic Substances Control U.S. Environmental Protection Agency	http://www.leginfo.ca.gov/calaw.html http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=hsc&codebody=&hits=20
Aboveground Petroleum Storage Act	California law that provides for implementation provisions of the federal SPCC Rule under the CWA.	California Health and Safety Code Sections 25270 to 25270.13	California Environmental Protection Agency	http://www.calepa.ca.gov/cupa/aboveground/
Safe Drinking Water and Toxics Enforcement Act	Law requiring the state to identify chemicals that cause cancer and reproductive toxicity, contains requirements for informing the public about the presence of these chemicals, and prohibits discharge of the chemicals into sources of drinking water.	Proposition 65	California Environmental Protection Agency Office of Environmental Health Hazard Assessment	http://oehha.ca.gov/prop65/law/P65law72003.html http://www.leginfo.ca.gov/calaw.html http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=hsc&codebody=&hits=20 http://www.leginfo.ca.gov/cgi-bin/displaycode?section=hsc&group=25001-26000&file=25270-25270.13
California Fire Code	Regulates the storage, use, and dispensing of hazardous materials, including materials that pose a physical or a health hazard.	Title 24 California Code of Regulations, Part 9, Chapters 27-43	California Department of Environmental Protection	http://publicecodes.citation.com/st/ca/st/b300v10/index.htm

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Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
Los Angeles Regional Water Quality Control Board	Responsible for regulating surface water discharge activities at SSFL.	CWA, 33 U.S.C. §1251 et seq. and § 1342, as amended	California Department of Environmental Protection State Water Resources Control Board Regional Water Quality Control Boards U.S. Environmental Protection Agency	http://www.swrcb.ca.gov/rwqcb4/ http://www.swrcb.ca.gov/water_issues/programs/#wqassessment http://www.waterboards.ca.gov/water_issues/programs/npdes/#process
Health and Safety Regulatory Setting				
Occupational Safety and Health Standards (OSHA)	Requirements for equipment for protecting worker health and safety used to store and handle hazardous materials	California Code of Regulations, Title 8 29 CFR 1910 et seq. and 29 CFR 1926 et seq.	California Department of Industrial Relations U.S. Department of Labor	https://www.dir.ca.gov/counters/t8index.htm http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=7e2f86cc16e34deca036ee4258c5ff0c&tpl=/ecfrbrowse/Title29/29cfr1910a_main_02.tpl http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div5&view=text&node=29:8.1.1.1.1&idno=29
California Hazard Communication Regulation	California Code of regulations that lists hazardous chemicals relating to the Hazardous Substance Information and Training Act; addresses control of hazardous substances; and addresses hot, flammable, poisonous, corrosive, and irritant substances.	California Code of Regulations, Title 8, Section 339, Section 3200 et seq., Section 5139 et seq., and Section 5160 et seq.	California Department of Environmental Protection California Department of Toxic Substances Control U.S. Environmental Protection Agency	https://www.dir.ca.gov/title8/339.html https://www.dir.ca.gov/Title8/sub7.html
Ventura County General Plan, Hazards Appendix	Provides discussions about physical, social, and other effects of hazards that are relevant to the ongoing and proposed activities.	Section 65300 of the California Government Code	Ventura County Resource Management Agency	http://www.ventura.org/rma/planning/general_plan/general_plan.html
Emergency Preparedness Program				

TABLE B-1
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Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
NASA Occupational Health Program Procedures				
Traffic Regulatory Setting				
Hazardous Material Regulations	Requires proper handling and storage of hazardous materials during transportation.	49 CFR, Subtitle B, Chapter 1, Subchapter C, Section 171-177 and Subtitle B, Chapter 3, Subchapter B, 350-399	U.S. Department of Transportation and California Department of Transportation	http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title49/49cfrv2_02.tpl http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?sid=4bbe4a2a0f15639beb030d232b148742&c=ecfr&tpl=/ecfrbrowse/Title49/49cfrv5_02.tpl#300
Hazardous Waste Haulers - Transportation	Addresses the safe transport of hazardous materials.	California Health and Safety Code §25160 et seq.	California Department of Transportation	http://www.leginfo.ca.gov/cgi-bin/displaycode?section=hsc&group=25001-26000&file=25160-25166.5 http://www.leginfo.ca.gov/cgi-bin/displaycode?section=hsc&group=25001-26000&file=25167.1-25169.3 http://www.leginfo.ca.gov/cgi-bin/displaycode?section=hsc&group=25001-26000&file=25169.5-25169.8
Transportation of Hazardous Material	Authorizes the issuance of licenses by the Commissioner of the CHP for the transportation of hazardous materials including explosives.	California Vehicle Code §§2500-2505 and 2531-2532	California Department of Transportation	http://www.leginfo.ca.gov/cgi-bin/displaycode?section=veh&group=02001-03000&file=2500-2505 http://www.leginfo.ca.gov/cgi-bin/displaycode?section=veh&group=02001-03000&file=2531-2532
Transporting of Hazardous Materials	Requires transporters to meet proper storage and handling standards for transporting hazardous materials on public roads.	California Vehicle Code §31300 et seq.	California Department of Transportation	http://www.leginfo.ca.gov/cgi-bin/displaycode?section=veh&group=31001-32000&file=31301-31309

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NASA SSFL EIS for Proposed Demolition and Environmental Cleanup

Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
Transportation of Hazardous Material - Licensing	Regulates the licensing of carriers of hazardous materials and includes noticing requirements.	California Vehicle Code §32000 – 32053	California Department of Transportation	http://www.leginfo.ca.gov/cgi-bin/displaycode?section=veh&group=31001-32000&file=32000-32004
Flammable and Combustible Liquids Administration and Regulation	Establishes special requirements for the transportation of flammable and combustible liquids over public roads and highways.	California Vehicle Code §34000 – 34100	California Department of Transportation	http://www.leginfo.ca.gov/cgi-bin/displaycode?section=veh&group=33001-34000&file=34000-34006 http://www.leginfo.ca.gov/cgi-bin/displaycode?section=veh&group=34001-35000&file=34019-34024 http://www.leginfo.ca.gov/cgi-bin/displaycode?section=veh&group=34001-35000&file=34060-34064 http://www.leginfo.ca.gov/cgi-bin/displaycode?section=veh&group=34001-35000&file=34100
Safety Regulations	Regulates the safe operation of vehicles, including those used to transport hazardous materials.	California Vehicle Code §§34500, 34501, 34501.2, 34501.3, 34501.4, 34501.10, 34505.5-7, 34506, 34507.5, and 34510-11	California Department of Transportation	http://www.leginfo.ca.gov/cgi-bin/displaycode?section=veh&group=34001-35000&file=34500-34520.5
Care and Protection of State Highways	Requires permits for any load that exceeds Caltrans weight, length, or width standards for public roadways.	California Vehicle Code §35780; California Streets and Highways Code §660-711	California Department of Transportation	http://www.leginfo.ca.gov/cgi-bin/displaycode?section=veh&group=35001-36000&file=35780-35796 http://www.leginfo.ca.gov/cgi-bin/displaycode?section=shc&group=00001-01000&file=660-661 http://www.leginfo.ca.gov/cgi-bin/displaycode?section=shc&group=00001-01000&file=670-695 http://www.leginfo.ca.gov/cgi-bin/displaycode?section=shc&group=00001-01000&file=700-711

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NASA SSFL EIS for Proposed Demolition and Environmental Cleanup

Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
	Regulates weight and load limitations.	California Vehicle Code §35550-35559	California Department of Transportation	http://www.leginfo.ca.gov/cgi-bin/displaycode?section=veh&group=35001-36000&file=35550-35558
Public Agency General Plan	Project must conform to the General Plan.	California State Planning Law, Government Code Section 65302	California Department of Transportation	http://www.leginfo.ca.gov/cgi-bin/displaycode?section=gov&group=65001-66000&file=65300-65303.4
Noise Regulatory Setting				
Ventura County General Plan	Established a nighttime noise ordinance	Section 65300 of the California Government Code	Ventura County Resource Management Agency	http://www.ventura.org/rma/planning/pdf/ordinances/Noise_Ordinance.pdf
Los Angeles County General Plan	Existing Adopted General Plan	Section 65300 of the California Government Code	Los Angeles Department of Regional Planning	http://planning.lacounty.gov/generalplan/existing
Noise Control Ordinance of Los Angeles County	Noise Element in the existing Adopted General Plan	Section 65300 of the California Government Code	Los Angeles Department of Regional Planning	http://planning.lacounty.gov/assets/upl/project/gp_web80-noise-element.pdf
Environmental Justice and Protection of Children Regulatory Setting				
Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations	Requires each federal agency to achieve environmental justice to the extent practicable by identifying and addressing disproportionately high adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations.	Executive Order 12898	All federal agencies (for Santa Susana Field Laboratory, U.S. National Aeronautics and Space Administration)	http://www.epa.gov/fedrgstr/eo/eo12898.pdf

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NASA SSFL EIS for Proposed Demolition and Environmental Cleanup

Applicable Regulation/Law	Relevance for SSFL	Citation	Administering/Responsible Agency	Hyperlink
Protection of Children from Environmental Health Risks and Safety Risks	Requires federal agencies make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children; and shall ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks.	Executive Order 13045	All federal agencies (for Santa Susana Field Laboratory, U. S. National Aeronautics and Space Administration)	http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=1997_register&docid=fr23ap97-130.pdf
Environmental Justice Guidance Under the National Environmental Policy Act	Provides guidance for identifying minority populations where the minority population of the affected area either exceeds 50 percent or is meaningfully greater than the minority population percentage in the general population.	42 U.S.C. § 4321 et seq. Executive Order 12898 40 CFR Parts 1500-1508	U.S. Environmental Protection Agency All federal agencies (for Santa Susana Field Laboratory, U. S. National Aeronautics and Space Administration)	http://www.epa.gov/compliance/ej/resources/policy/ej_guidance_nepa_ceq1297.pdf
Environmental Justice Strategy	Ensure the integration of environmental justice into U. S. National Aeronautics and Space Administration programs, policies, and activities	42 U.S.C. § 4321 et seq. Executive Order 12898 40 CFR Parts 1500-1508	U. S. National Aeronautics and Space Administration	http://www.epa.gov/compliance/ej/resources/publications/interagency/nasa-strategy-1995.pdf

End of Appendix B

APPENDIX C

Section 106 Findings of Effect Consultation Report, Ventura County, California

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Confidential

Draft Cultural Resources Study for Environmental Cleanup and Demolition at Santa Susana Field Laboratory, NASA Areas I and II, Ventura County, California

Prepared for

National Aeronautics and Space Administration

Huntsville, Alabama

June 2013

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Draft Cultural Resources Study for Environmental Cleanup and Demolition at Santa Susana Field Laboratory, NASA Areas I and II, Ventura County, California

Report Prepared For:

National Aeronautics and Space Administration
George C. Marshall Space Flight Center
Marshall Space Flight Center, AL 35812

Prepared by:
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CH2M HILL
6 Hutton Centre Drive, Suite 700
Santa Ana, CA 92707

June 2013

National Archaeological Database (NADB)

Type of Study: Literature Search, Survey, and Evaluation
Sites Recorded: CA-VEN-1800
Isolates Recorded: None
USGS Quadrangle: Calabasas, CA;
Acreage: 490 acres
Level of Investigation: NEPA and Section 106

Key Words: Simi Valley, NASA, Alfa Test Area, Bravo Test Area, Coca Test Area, Historic Districts, Burro Flats, NEPA, Isolate, prehistoric site, Chumash, Gabrieleño, Tataviam

STATEMENT OF CONFIDENTIALITY:

Due to the sensitive nature of cultural resources described herein, this report is confidential and should be withheld from public distribution, in accordance with43 CFR 7.18[a][1] and Section 304 of the National Historic Preservation Act.

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Executive Summary

This report provides the results of several phases of work designed to locate and document historic properties within the National Aeronautics and Space Administration (NASA)-administered Liquid Oxygen (LOX) Plant Area I and Area II at the Santa Susana Field Laboratory (SSFL) in Ventura County, California. This study has been prepared in support of Section 106 of the National Historic Preservation Act (NHPA), which requires federal agencies to identify historic properties and take into account the effects of their undertakings on historic properties, as well as the National Environmental Policy Act (NEPA). NASA currently is preparing an Environmental Impact Statement (EIS) for the undertaking, or Proposed Action, which will include the results of this study.

Cultural resources include prehistoric and historic archaeological sites, districts, and objects; standing historic structures, buildings, districts, and objects; locations of important historic events; and Native American sites and cultural properties such as sites of traditional cultural importance to various groups. 36 *Code of Federal Regulations* (CFR) 800 defines a historic property as any prehistoric or historic district, site, building, structure, or object listed in, or eligible for listing in, the National Register of Historic Places (NRHP).

Cultural resource inventories of the NASA-administered portion of SSFL were conducted in 2007, 2008, 2009, and 2011. These inventories together include the entirety of the NASA-administered portion of SSFL and some areas outside this area that likely will need to be remediated as a part of this undertaking, covering a total of 198.3 hectares (ha) (490 acres). Previous work consisted of the full recordation of the Burro Flats Painted Cave Site (CA-VEN-1072), recordation of CA-VEN-1800, a prehistoric rockshelter site (Emmick and Bard, 2008; McClintock, Wilt, and Emmick, 2009), and recordation of CA-VEN-1803 in 2010 (Hogan and Tang, 2010). CA-VEN-1800 and CA-VEN-1803 are being considered potentially eligible for listing in the NRHP for this undertaking.

An assessment of the built environment was conducted in 2007 by Archaeological Consultants, Inc., and Weitze Research. This survey assessed 135 federally owned buildings, structures, and sites within NASA-administered LOX Plant Area I and Area II of SSFL. The results of this investigation identified three historic districts–the Alfa, Bravo, and Coca Test Areas–and nine individually eligible structures within the districts (ACI and WR, 2009). The Alfa, Bravo, and Coca Test Area historic districts are eligible for listing in the NRHP, and within these three historic districts, six test stands and three associated control houses are individually eligible for the NRHP. The California State Historic Preservation Officer (SHPO) concurred with the eligibility of these three districts and their contributing elements, as well as with the individual eligibility of the nine structures, on May 15, 2008. Correspondence summaries are included in Appendix B.

NASA initiated NHPA Section 106 consultation with the California SHPO and the Advisory Council on Historic Preservation (ACHP) on June 30, 2011. The initiation letter notified SHPO and ACHP of NASA's intent to use the NEPA process and documentation to comply with Section 106, in accordance with 36 CFR 800.8. The Area of Potential Effects for this project was developed in consultation with the SHPO in 2011 and 2012.

NASA has found that the Proposed Action - demolition of up to 100 percent of structures, soil cleanup to background levels, and groundwater cleanup - would result in an adverse effect on historic properties, as detailed in the effects analysis and findings in the cultural resources subsection of Section 4 of the EIS. Consultation with the SHPO, ACHP, Native Americans, and other consulting parties is ongoing. This consultation will culminate in measures to avoid, minimize, or mitigate adverse effects on historic properties. A Record of Decision will be prepared as the document that stipulates the appropriate measures and formalizes agreement among the parties.

A copy of this report will be filed with the South Central Coastal Information Center of the California Historical Resources Information System located at California State University, Fullerton, in accordance with the Office of Historic Preservation's Information Management program.

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Appendixes

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Acronyms and Abbreviations

ACI	Archaeological Consultants, Inc.
ACHP	Advisory Council on Historic Preservation
AFP	Air Force Plant
amsl	above mean sea level
AOC	Administrative Order on Consent
APE	area of potential effects
Boeing	The Boeing Company
CFR	*Code of Federal Regulations*
CHRIS	California Historical Resources Information System
CRHR	California Register of Historical Resources
DPR	Department of Parks and Recreation
DoD	U.S. Department of Defense
EIS	Environmental Impact Statement
EO	executive order
ft	feet
GPS	global positioning system
ha	hectare
ICRMP	Integrated Cultural Resources Management Plan
km	kilometer
m	meter
LOX	Liquid Oxygen Plant
n.d.	not dated
NAA	North American Aviation
NAGPRA	Native American Graves Protection and Repatriation Act of 1990
NAHC	Native American Heritage Commission
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
OHP	California Office of Historic Preservation
ROD	Record of Decision
SCCIC	South Central Coastal Information Center
SHPO	State Historic Preservation Officer
SSFL	Santa Susana Field Laboratory
U.S.	United States
U.S.C.	United States Code
USAF	U.S. Air Force
USGS	U.S. Geological Survey
WR	Weitze Research
yd^3	cubic yards

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SECTION 1

Introduction

This report provides the results of several phases of cultural resources assessment within the National Aeronautics and Space Administration (NASA)-administered Liquid Oxygen (LOX) Plant Area I and Area II at the Santa Susana Field Laboratory (SSFL) in Ventura County, California (Figure 1). The Proposed Action is to remediate the environment to a level that meets NASA's environmental cleanup responsibilities and to undertake the demolition actions necessary to support both remediation and property disposition of the NASA-administered portion of SSFL. This report has been prepared in support of Section 106 of the National Historic Preservation Act (NHPA), as well as the National Environmental Policy Act (NEPA). Section 106 of NHPA requires federal agencies to take into account the effects of their undertakings (the Proposed Action) on historic properties. NASA currently is preparing an Environmental Impact Statement (EIS) for the undertaking, which will include the results of this study. The Integrated Cultural Resources Management Plan (ICRMP) for SSFL, published in 2009, also provides guidance about how to identify, evaluate, and treat cultural resources at SSFL in compliance with NASA policy and state and federal regulations (NASA, 2009).

SSFL is located on 1,618,745 hectares (ha) (2,850 acres) in Ventura County, California, approximately 11.3 kilometers (km) (7 miles) northwest of Canoga Park and approximately 48.3 km (30 miles) northwest of downtown Los Angeles. SSFL is composed of four administrative areas known as Areas I, II, III, and, IV and two unnumbered areas known as "Undeveloped Area." NASA administers 16.9 ha (41.7 acres) within LOX Plant Area I and all 165.7 ha (409.5 acres) of Area II. The Boeing Company (Boeing) owns the remaining property within Areas I, III, and IV, and the two undeveloped areas. Specifically, the project area is located within Township 2 North, Range 17 West, of an unsectioned area of the 1952 (photo revised 1967) *Calabasas, California* 7.5' U.S. Geological Survey (USGS) quadrangle maps.

Since the mid-1950s, when Areas I and II were acquired by the United States (U.S.) Air Force (USAF), this site has been used for developing and testing rocket engines. Four test stand complexes (Alfa, Bravo, Coca, and Delta) were constructed in Area II between 1954 and 1957. Area II and the LOX Plant portion of Area I were transferred to NASA from the USAF in the 1970s.

This assessment includes a review of previous studies and pedestrian surveys within the Area of Potential Effects (APE) and the results of these investigations, as well as a summary of effects on historic properties from the Proposed Action. The full analysis of the effects of the Proposed Action on historic properties is contained in Section 4 of the EIS.

This report includes several appendixes: Appendix A contains representative photographs from the 2011 field survey; Appendix B contains a summary of the consultation record; Appendix C provides project personnel qualifications; and Confidential Appendix D depicts the cultural resources located within the APE. The maps in Appendix D are kept confidential to protect the archaeological sites because of their sensitive nature. Section 9 of the Archaeological Resources Protection Act of 1979 and 36 *Code of Federal Regulations* (CFR) 800.11(c) provide discussions regarding the confidentiality of sites.

Project personnel included Principal Investigator/Field Director Gloriella Cardenas, M.A., RPA, and cultural resources specialist Michelle Kaye, Ph.D. Senior cultural resources specialist Clint Helton, M.A., RPA, provided senior technical review. Secretary of the Interior-qualified architectural historians Lori Price and Sara Orton contributed to this analysis, particularly in the cultural resources section of the EIS.

1.1 Proposed Action

NASA entered into an Administrative Order on Consent (AOC) for Remedial Action with the California Department of Toxic Substances Control on December 6, 2010, "to further define and make more specific NASA's obligations with respect to the cleanup of soils at Santa Susana Field Laboratory (SSFL)." As such, NASA is preparing an EIS to analyze the potential environmental impacts of demolition and cleanup activities on the NASA-administered

portion of SSFL. The Proposed Action analyzed and evaluated in the EIS includes demolition of up to 100 percent of structures within the APE, as well as ancillary structures, including 55 structures within the boundaries of the three historic districts. It should be noted that even if demolition is not necessary to meet cleanup goals, removal of a structure might occur as NASA prepares the site for disposition. The Proposed Action also includes soil cleanup to background levels through excavation and offsite disposal of the contaminated soil, and ex situ and in situ soil remediation technologies. The total area of the soil remediation footprint is approximately 105 acres and entails cleanup of approximately 500,000 cubic yards (yd^3) of contaminated soil within the APE. Finally, the Proposed Action includes groundwater cleanup within the APE. Section 2 of the EIS describes the Proposed Action and cleanup technologies in greater detail.

As part of excavation and offsite disposal, approximately 320,000 yd^3 of soil (64 percent of the total contaminated soil) must be removed from SSFL because it is considered non-treatable contaminated soil and must be disposed of offsite. Stratification (or layering) of the contamination could require that the majority of contaminated areas would have to have the top 2 feet (ft) of non-treatable soil excavated, removed, and disposed offsite. The remaining approximately 180,000 yd^3 of contaminated soil (36 percent of the total contaminated soil) is considered treatable, but might need to be excavated if none of the remediation technologies are found to be effective in meeting the cleanup goals. The ex situ soil remediation technologies being considered (Thermal Desorption, Soil Washing, Chemical Oxidation, and Land Farming) would be used only after the 320,000 yd^3 or more of non-treatable soil has been excavated and removed. These technologies would be used to remediate the remaining 180,000 yd^3 of treatable soil. The in situ soil remediation technologies (Soil Vapor Extraction, Anaerobic or Aerobic Biological Treatment, and Chemical Oxidation or Reduction) also would only be used for treatable soils; the soils would be treated in place and would not require excavation.

The groundwater remediation technologies to be considered include Pump and Treat, Vacuum Extraction, Iron Particle Injection, Heat-Driven Extraction, In situ Chemical Oxidation, In situ Enhanced Bioremediation, Monitored Natural Attenuation, and Institutional Controls. One or a combination of these technologies might be applied to meet the groundwater cleanup goals. Some ground disturbance would be necessary for the installation of wells, boreholes, piping, manifolds, tanks, or a power source, but this work could be done in discrete locations to minimize impacts. Depths of wells and boreholes for these technologies could range from approximately 50 to 900 ft below ground surface. The drills for the wells would be 8 inches or less in diameter, more likely 4.5 to 5 inches in diameter. The piping would be above ground and would be on small concrete pilings.

1.2 National Register of Historic Places Eligibility

The preservation of historic properties became national policy first with the passage of the Antiquities Act of 1906. The Historic Sites Act of 1935 continued the goal of preserving historic properties. Finally, the NHPA was passed in 1966. The National Register of Historic Places (NRHP) was established as part of the NHPA.

Cultural resources include prehistoric and historic archaeological sites, districts, and objects; standing historic structures, buildings, districts, and objects; locations of important historic events; and sites of traditional or cultural importance to various groups. 36 CFR 800 defines a historic property as any prehistoric or historic district, site, building, structure, or object listed in, or eligible for listing in, the NRHP. The criteria used to evaluate properties for the NRHP are provided in 36 CFR 60 and listed in the following bullets. A resource must meet one or more of these criteria to be considered for eligibility:

- Be associated with events that have made a significant contribution to the broad patterns of history (Criterion A).
- Be associated with the lives of persons significant to our past (Criterion B).
- Embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, possess high artistic values, or represent a significant and distinguishable entity whose components might lack individual distinction (Criterion C).
- Have yielded, or have the potential to yield, information important to prehistory or history (Criterion D).

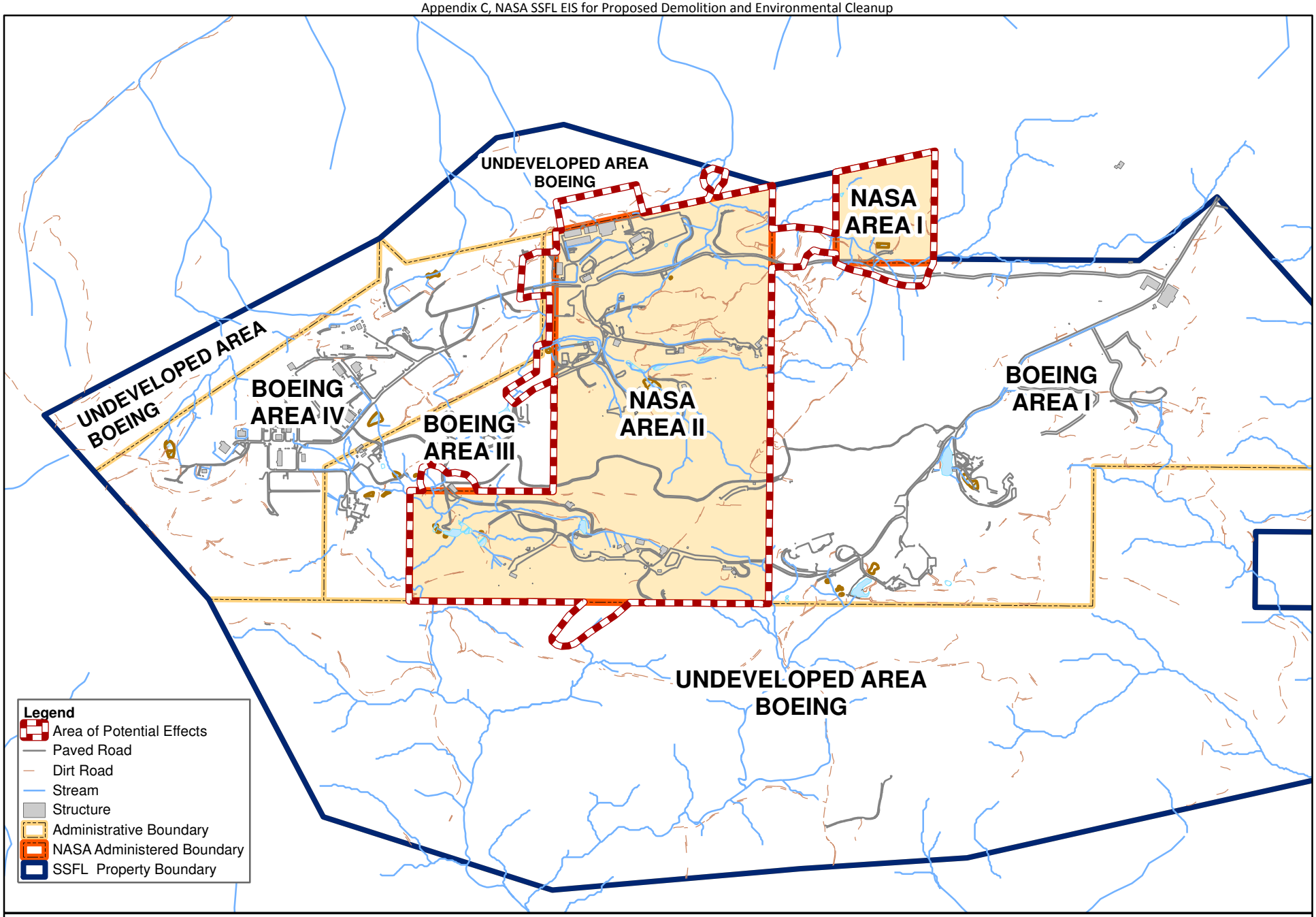

Figure 1
Regional Map
NASA - Santa Susana Field Laboratory
Ventura County, California

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Generally, properties must be 50 years old to be eligible for the NRHP, but those that have achieved significance within the past 50 years may be eligible under Criteria Consideration G, which states that a property achieving significance within the last 50 years can be eligible if it is of exceptional importance.

In addition to meeting one or more of these criteria, a resource must retain integrity to be considered a historic property. Integrity is the authenticity of the physical identity, as evidenced by the survival of characteristics that existed during the resource's period of significance. Historic properties must retain enough of their historic character or appearance to be recognizable and to convey the reasons for their significance. The seven aspects of integrity, presented in 36 CFR 60, are location, design, setting, materials, workmanship, feeling, and association. A resource that has lost its historic character or appearance and is not eligible for the NRHP still might have sufficient integrity for the California Register of Historical Resources (CRHR), if it maintains the potential to yield significant scientific or historic information or specific data.

The CRHR is used as a guide by state and local agencies, private groups, and citizens to identify state historical resources and to decide which properties are to be protected, to the extent prudent and feasible, from substantial adverse change. The CRHR, as instituted by the California Public Resources Code, automatically includes those California properties already listed in the NRHP. It also includes those formally determined to be eligible for listing in the NRHP (Categories 1 and 2 in the State Inventory of Historical Resources), as well as specific listings of State Historical Landmarks and State Points of Historical Interest. The CRHR also might include other types of historical resources that meet the criteria for eligibility, including the following:

- Individual historic resources
- Resources that contribute to a historic district
- Resources identified as significant in historic resource surveys
- Resources with a significance rating of Category 3 through Category 5 in the State Inventory (Categories 3 and 4 refer to potential eligibility for the NRHP; Category 5 indicates a property with local significance)

The CRHR follows the lead of the NRHP in using the general 50-year threshold. A resource usually is considered for its historic significance after it reaches the age of 50 years. This threshold is not absolute, but was selected as a reasonable span of time after which a professional evaluation of historic value or importance can be made.

1.3 Area of Potential Effects

The APE for historic properties includes approximately 198.3 ha (490 acres), including 182.6 ha (451.2 acres) of NASA-administered property; 16.9 ha (41.7 acres) in Area I, and 165.7 ha (409.5 acres) in Area II (Figure 2). An additional 15.7 ha (39 acres) of Boeing property are included in the APE, because these areas likely would be part of NASA's cleanup activities. The APE is the area in which the direct and indirect effects of a project may cause alterations to the character of historic properties. The APE for this project was developed in consultation with the State Historic Preservation Officer (SHPO). It incorporates the entirety of the NASA-administered property in LOX Plant Area I and Area II, as well as a few areas outside those boundaries that likely will need to be remediated as a part of the environmental cleanup.

NASA initiated NHPA Section 106 consultation with the California SHPO and the Advisory Council on Historic Preservation (ACHP) on June 30, 2011. This letter notified SHPO and ACHP of NASA's intent to use the NEPA process and documentation to comply with Section 106, in accordance with 36 CFR 800.8. The APE for this project was developed in consultation with the SHPO in 2011 and 2012. Consulting parties received the APE in May 2012 and were afforded the opportunity to comment on the APE for this undertaking.

1.4 Sacred Sites

In December 2012, NASA received notice from the federally recognized Santa Ynez Band of Chumash Indians of the tribe's designation of the NASA portion of SSFL as an Indian sacred site, in accordance with Executive Order

(EO) 13007 (*Federal Register*, 1996). Currently, there are no specific boundaries of the sacred site. The EO aims to "protect and preserve Indian religious practices" and states that agencies managing federal lands shall:

> *(1) Accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and*
>
> *(2) Avoid adversely affecting the physical integrity of such sacred sites. Where appropriate, agencies shall maintain the confidentiality of sacred sites* (*Federal Register*, 1996).

The definition of an Indian "Sacred Site" according to the EO is:

> *Any specific, discrete, narrowly delineated location on Federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site*" (Federal Register, 1996).

NASA continues consultation with the Santa Ynez Band of Chumash Indians regarding the Proposed Action and the potential impacts to the designated Indian sacred site. This is a confidential process.

1.5 Traditional Cultural Properties

The following definition is adapted from the *Guidelines for Evaluating and Documenting Traditional Cultural Properties* (National Park Service [NPS], 1990b): Traditional cultural properties consist of sites that have significance in beliefs, customs, and practices with a living community of people that have been passed down through the generations, usually orally or through custom. Traditional use properties can include cultural use areas such as harvesting sites, cemeteries, or religious sites, and their significance is derived from the role the property plays in the community's historically rooted beliefs, customs, and practices.

A Traditional Cultural Property and Cultural Landscape Assessment currently is being conducted. This assessment includes an investigation and evaluation of the existence and extent of a potential Traditional Cultural Property together with an assessment of a potential cultural landscape. Individuals with knowledge of the region are conducting the assessment, which includes interviews with local, state, and national tribes. The results of this investigation and evaluation will be summarized in the final version of this report. The assessment report will remain confidential and will not be attached to this report.

1.6 Cultural Flora and Fauna

NASA submitted the SSFL 2011 biological inventory of species identified during the 2010 and 2011 biological surveys to the Santa Ynez Band of Chumash Indians for input regarding historically used flora and fauna found on SSFL. Six plants and five animals were identified by the tribe as having known cultural uses by the Santa Ynez Band of Chumash Indians. Table 1 lists these species, along with the noted cultural uses. The Traditional Cultural Properties and Cultural Landscape Assessment investigation might identify additional flora and fauna historically used by Native Americans in the region.

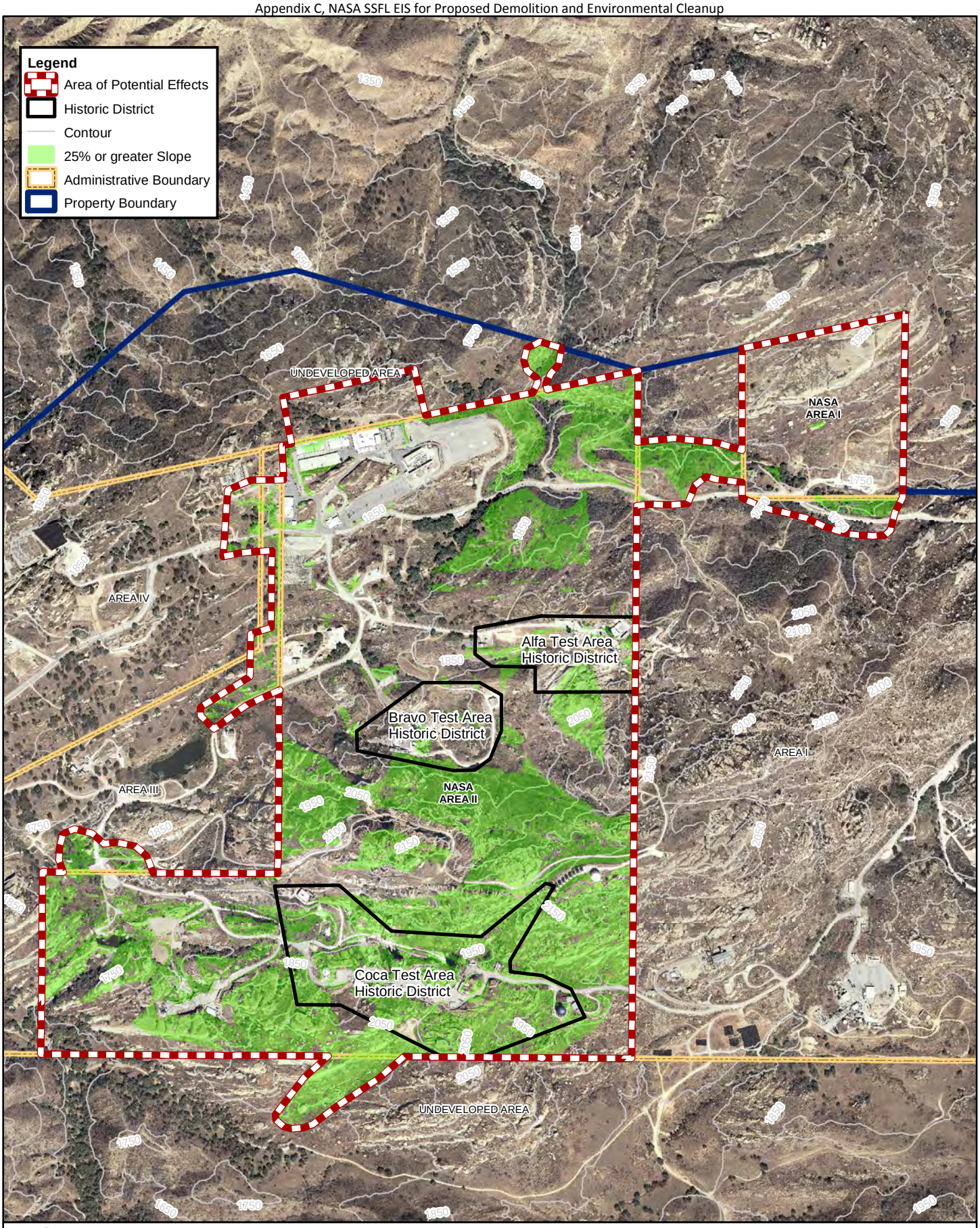

Figure 2
Area of Potential Effects
NASA - Santa Susana Field Laboratory
Ventura County, California

Map Document: O:\NASA\SSFL\maps\EIS_2011\CultResrc_APE.mxd

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TABLE 1
Flora and Fauna with Recognized Native American Cultural Uses
Cultural Resources Study for Environmental Cleanup and Demolition for SSFL, NASA Areas I and II

Species Name	Common Name	Cultural Use
Flora Species		
Asclepias eriocarpa	Broad leaved Milkweed, Jumete sp.	Culturally recognized for material culture use and ceremonial use; currently used.
Asclepias fascicularis	Narrow leaved Milkweed, Jumete sp.	Culturally recognized for material culture use and ceremonial use; currently used.
Amsinckia menziesii	Common Fiddleneck	Culturally recognized as a food source and ceremonial use.
Marah macrocarpus	Wild cucumber, Manroot, Chilicote sp.	Culturally recognized for material culture use, medicinal, edible and ceremonial use; currently used.
Quercus agrifolia.	Coast Live Oak, Encino sp.	Culturally recognized as a staple food source and ceremonial use; currently used.
Salvia columbariae	Chia Sage, Chia sp.	Culturally recognized as a food source and ceremonial use; currently used.
Fauna Species		
Phrynosoma blainvillii, Anota coronatum	Coast Horned Lizard	Culturally recognized in song and ceremony.
Melanderpes formicivorus	Acorn woodpecker	Culturally recognized in oral tradition and ceremonially recognized.
Corvus brachyrhynchos	American Crow	Culturally recognized in oral tradition, song, and ceremony.
Corvus corax	Common Raven	Culturally recognized in oral tradition and ceremonially recognized.
Geococcyzus californianus	Greater Roadrunner	Culturally recognized in oral tradition and ceremonially recognized.

Source: Santa Ynez Band of Chumash Mission Indians (2011)

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SECTION 2

Setting

2.1 Environmental Setting

SSFL is in southeastern Ventura County near the crest of the Simi Hills between the Simi and San Fernando Valleys. SSFL is bordered by Bell Canyon to the south and Meier and Runkle Canyons to the northwest. The Simi Hills are part of the Santa Monica Mountains, which run east-west across Southern California and form part of the California Coast Range of the Pacific Mountain System physiographic region. The mountains consist mainly of late-middle to early Tertiary sedimentary rocks (8 to 70 million years old). The mountains are low in elevation, which results in mild, rainy winters and warm, dry summers.

The elevation ranges from 503 to 663 meters (m) (1,650 to 2,175 ft) above mean sea level (amsl) in the APE, which consists of a diverse terrain of ridges, canyons, and sandstone rock outcrops (Figures 3 and 4). The geology of the area is composed of the Chatsworth Formation, which consists of sediments that range from hard sandstone bedrock to clay, shale, and crushed sandstone; topsoils are alluvially deposited sand, silt, and clay from erosional processes. Vegetation includes Venturan coastal sage scrub, chaparral, annual grasses, oak woodland, southern coast live oak riparian forest, and non-native eucalyptus. The banks of ephemeral streams also are lined with sycamores. Native animals in the area include mule deer, bobcats, mountain lions, coyotes, gray foxes, turkey vultures, hawks, California quail, and ring-tailed cats.

FIGURE 3
NASA Area I Overview
October 2011
Cultural Resources Study for Environmental Cleanup and Demolition for SSFL, NASA Areas I and II

FIGURE 4
NASA Area II Overview
October 2011
Cultural Resources Study for Environmental Cleanup and Demolition for SSFL, NASA Areas I and II

2.2 Cultural Context

Abundant evidence exists that humans were present in North America for at least the past 11,500 years. In addition, fragmentary, but growing, evidence exists that humans were present long before that date. Linguistic and genetic studies suggest that human colonization of North America may have occurred 20,000 to 40,000 years ago. Evidence of this earlier occupation is not yet conclusive, but is beginning to be accepted by archaeologists. The Meadowcroft Rockshelter in Pennsylvania, Saltville and Cactus Hill in Virginia, and the Topper site in South Carolina, for instance, are sites that have produced apparently reliable dates as early as 12,500 years before present (Goodyear, 2005).

Ancient sites are known in southern California. In January 1936, Work Projects Administration workers digging a storm drain along the Los Angeles River (north of Baldwin Hills) recovered human bones from an ancient streambed (Moratto, 1984). In March 1936, imperial mammoth teeth were exposed at the same depth as the human remains (Moratto, 1984:53). The next oldest site in southern California where both human skeletal remains and artifacts occur is the La Brea Tar Pits (CA-LAN-159). The Arlington Spring site on Santa Rosa Island has provided occupation dates as early 13,000 years old; the discovery of Arlington Spring Man is the second find in North America that has dated to this period (NPS, 2012). Evidence for Paleo-Indian occupation in California exists, but particularly along the coast of southern California, remains scanty (Byrd and Raab, 2007).

The general trend throughout California prehistory was an increase in population density over time, coupled with greater sedentism and the use of a greater diversity of food resources. Chartkoff and Chartkoff (1984) identified three major periods of prehistory observed throughout California: Pre-Archaic, Archaic, and Pacific. These patterns are roughly correlated with the Paleoindian, Archaic, and Emergent periods developed by Fredrickson (1984) for north coastal California. Southern California has had multiple proposed chronological sequences, but no overall accepted model exists. The lack of an unchallenged and accepted chronology is due to problems dealing with gaps in the archaeological record such as the unavailability of continuous dateable materials, inconsistencies

in the data and their recordation, and a lack of cultural elements that are definitive of a temporal period or a specific cultural group.

To obtain prehistoric chronologies, group territories, and hallmarks of cultural periods, adaptations from other regions, cultures, and studies have been synthesized to create a chronological overview for prehistoric southern California.

The following chronology is based on Byrd and Raab's updated synthesis of the southern bight cultures, a region that encompasses the California coast from Point Conception in the north to the American/Mexican border in the south and that includes the project area (2007).

2.2.1 Early Holocene (9,600 cal B.C. to 5,600 cal B.C.)

The first groups to inhabit California (for which there is significant evidence) are described as hunters and gatherers with specialized bifacial projectile points, well-made scrapers, knives, and many other tools designed for subsistence-related tasks (food processing). They adapted to a number of environments and developed a variety of secondary subsistence strategies that enabled them to live in a changing environment (Pleistocene to Holocene). As the (Wisconsin) Ice Age ended, previously stable water sources began to dry up in inland California, prompting migrations to the coast. California's islands were occupied as early as 9,600 to 9,000 (calibrated) B.C., as indicated by the oldest levels at Daisy Cave on San Miguel Island. Southern California dwellers exploited a wider range of plants and animals and the archaeological record shows that a greater emphasis was placed on gathering wild grasses and seeds, rather than on hunting large mammals. Groups with coastal territories used marine resources such as shellfish, fish, sea lions, and dolphins. Shell midden sites of the early Holocene are characterized by cobble tools, basin metates, manos, discoids, and flexed burials (Byrd and Raab, 2007).

2.2.2 Middle Holocene (6,000 cal B.C. to cal A.D. 500)

At the start of the Middle Holocene, millingstone cultures appeared throughout central and southern California. The Millingstone Horizon represents an adaptive subsistence shift indicated by the first occurrence of millingstones (mano and metate), which were used to process hard seeds like *Salvia* sp. (sages) and *Eriogonum fasciculatum* (wild buckwheat). Sites from this period are characterized by the majority of artifacts being manos and metates, suggesting the importance of vegetal resources. Most of these sites are located in grassland and sagebrush communities where these hard seeds could support small populations on a yearly basis. Late fall and winter were difficult seasons when vegetal foods were scarce and diets had to be supplemented with deer and small mammal hunting and shellfish collecting (Tartaglia, 1976).

Middle Holocene cultures were quite diverse. Large middle Holocene sites have been well documented along the coast, as well as inland. Archaeological evidence of extensive trade networks between southern California and the Southwest has been found. Rare artifact types, including the marine purple olive shell, indicate that trade networks extending from Catalina Island through the Mojave Desert and into Oregon were extant in the Middle Holocene (Byrd and Raab, 2007).

Temporary settlements for a few nuclear families (10 to 25 individuals) have been recorded. These sites were seasonal campsites for exploiting yucca and acorns from April through September. The seasonal pattern has been documented as a regional variation in the Millingstone Horizon sites in southern California (King, 1967). These sites are characterized by plant processing tools (scraper planes, millingstones, and earth ovens–necessary to prepare yucca–and an absence of hunting implements. People intensively exploited their environment, with reliance on no particular food resource. Characteristic features of this period included crude chopping tools, large projectile points, manos and metates, *Olivella* shell beads, quartz crystals and cog stones, few ornaments, earth roasting pits, extended posture burials, reburials (secondary interment), and rock cairns (Wallace, 1955:219-221). The first evidence of cemeteries is recorded during this period, and based on the relative absence of non-utilitarian artifacts; an egalitarian social system was likely to have been in operation (Tartaglia, 1976). Recent evidence indicates that the first permanent villages may have been erected during the Middle Holocene on San Clemente Island (Byrd and Raab, 2007). The presence of daub at Middle Holocene coastal sites indicates that at least some of the villages along the coast may have had permanent structures.

Sites in southern coastal California, specifically within the southern bight region, associated with this period are Little Sycamore Shellmound (CA-VEN-1) and Glen Annie Canyon Site (CA-SBA-142).

2.2.3 Late Holocene (cal A.D. 500 to Historic Contact)

The Late Holocene is characterized by a larger number of more specialized and diversified sites. Population increased substantially and is reflected in a greater number of sites recorded during this time. This period is characterized by (Wallace, 1955:223-226) large village sites, tightly flexed burials, bow and arrow, arrowshaft straighteners, *ollas* (jars) and *comals* (cooking flats), personal ornaments, pottery vessels, circular shell fishhooks, an extensive trade network, a wide variety of ritual objects, and large stone bowls. Elaborate mortuary artifacts are recovered from sites of this period.

Villages occurred in the same general locations as they did in earlier periods, but increased in size and decreased in frequency; base camps often were associated with villages. There was also an increase in the number of specialized and/or diversified sites. Trade was extensive during this period and long distances are reflected in artifacts recovered from the American Southwest (pottery) in California sites, while steatite objects and Pacific Coast seashells occur in American Southwest sites. During the Late Period, many more classes of artifacts are found in the archaeological record that reveal a higher order of workmanship. Larger and more extensive settlement systems are evident, likely a byproduct of a more intensive subsistence base exploiting all the available food resources. The bow and arrow was introduced, along with other aspects of the culture being expanded (population growth and more complex social system and trade network).

New studies indicate that culture change in southern California may have been rapid, rather than gradual. Overexploitation of resources may have caused shifts to new resources that occurred in greater amounts (Byrd and Raab, 2007). On the coast, intensified fishing and small sea mammal hunting replaced hunting of large sea mammals and shellfish collection. Fish resources were concentrated on smaller, near-shore species, rather than on deep sea resources. Vegetal resources focused on grasses rather than acorns and direct evidence for acorn use is minimal at Late Holocene sites. Changes in subsistence strategies in prehistoric California appear to be related to overexploitation of preferred resources, leading to a shortage of the desired resource, followed by shifts to more costly resources (Byrd and Raab, 2007).

The archaeological record for the immediate region contains significant data with NRHP-listed sites such the Burro Flats Painted Cave (CA-VEN-1072), Bony Peak (CA-VEN-195), the Anacapa Island Archaeological District in Port Hueneme, Calleguas Creek Site(CA-VEN-110), and the village sites at Goleta Slough (*Helo, Saxpilil, Geliec,* and *Alcas).*

2.3 Ethnohistory

SSFL is prehistorically and historically within a territory transitional zone for three Native American groups (the Chumash, the Tataviam, and the Gabrieleño or Tongva); documentation as well as tribal oral histories indicate that the three groups visited the SSFL locale to some degree (NASA, 2009).

The prehistoric site known as Burro Flats Painted Cave was occupied at the very least from A.D. 1100 through 1810 to 1820 (Emmick and Bard, 2008; NASA, 2009). This site has been associated with the Chumash of Simi Valley and Simi Hills and the Gabrieleño of the San Fernando Valley; through oral histories, the Tataviam also claim a connection with Burro Flats (Emmick and Bard, 2008; King, 2012; Knight, 2012; NASA, 2009). Burro Flats Painted Cave is a prehistoric archaeological site in Area II that also extends into Boeing-managed undeveloped lands. This site is famous for its many panels of pictographs or rock art paintings and petroglyphs, which are rock art that has been scored or incised into the rock surface, in sandstone rock shelters. It also includes many bedrock milling features that may have been used for grinding acorns and smaller cupules that may have been used for processing food or served an aesthetic function. Much of the site consists of midden, which is debris associated with human habitation. While documenting the middens at the site, Rozaire (1959; 1960a) noted that they consisted of debitage, burned bone, and shell fragments. Rozaire also excavated a cremation burial that revealed a mortuary practice used by the Gabrieleño. Recent analysis of the artifact assemblage recovered from the

excavation investigations has provided occupation dates that now state occupation of this site has been ongoing for approximately 5,000 years (King, 2012).

During late prehistory and into ethnohistoric times, two known Native American villages were near SSFL–the Chumash settlement of Huwam, also known as El Escorpion, located in Bell Canyon at the western end of the San Fernando Valley, and the Gabrieleño village of Momonga in Chatsworth.

2.3.1 Chumash

The Chumash language belongs to the Hokan linguistic stock. The Chumash occupied the territory between Point Conception and Malibu, including three of the Channel Islands. This span of territory afforded the Chumash large trade networks that webbed into central California (King, 1971). The Chumash economic activities produced great wealth and possibly allowed for population increase; the largest villages of the pre-contact Chumash reportedly contained a thousand members (Moratto, 1984).

The Chumash were a maritime people who exploited all coastal resources with accomplishment. Like all maritime cultures, successful marine resource procurement was heavily dependent on the seaworthiness of fishing vessels; the Chumash were master plank canoe, or *tomol* builders (Gamble, 2002). Plank canoe building is credited with establishing the sociopolitical power the Chumash held amongst their neighbors, with the exception of the Gabrieleño, who also were a maritime culture and seem to have been sociopolitical equals to the Chumash (Gamble, 2002; McCawley, 1996). Along with marine resource procurement, control of waterways provided the Chumash with a command of transportation and goods distribution to the interior, resulting in the Chumash controlling various trade networks (Gamble, 2002).

The Chumash society was composed of multiple bands or tribelets who followed a patrilinear social system. As with their Gabrieleño neighbors, the Chumash had a strict socio-economic hierarchy made up of elites and non-elites; only the chief could have multiple wives (Fages, 1775; McCawley, 1996). It is theorized that there was an inter-dependent relationship between those who specialized in craft production and the elites, who managed the distribution of goods (Arnold, 2004). Chester King (1971) reports that the Chumash controlled a widespread market economy in which standardized production of goods provided highly saleable materials.

Like most hunter-gatherers, the Chumash moved seasonally, primarily in the summer, to optimize their resources. It is reported that they kept permanent winter villages, confining the seasonal camps to temporary occupancy during resource procurement, harvesting, and hunting (Arnold, 2004; King, 1971). Subsistence patterns appear to be similar to those of the Gabrieleño (Arnold, 2004; Gamble, 2002; McCawley; 1996).

At the time of Missionization, baptismal records indicate an average population of 90 members per village and reports by Fages (1775) estimate a total of 3,000 Chumash at the time of contact. However, a Chumash village survey by Kroeber documented 41 villages on the coast and 25 villages in the interior; the survey results yielded population estimates at more than 10,000 members (Cooke, 1976).

2.3.2 Gabrieleño/Tongva

The Gabrieleño are named after the Mission San Gabriel, where the area tribes were relocated shortly after European control was established. Tongva is another name some of the tribal members prefer to use. Although both names are in use today, this report will refer to the tribe as Gabrieleño for ease of understanding.

The Gabrieleño language belongs to the Takic sub-family of the Uto-Aztecan language stock. The territory of the Gabrieleño was composed of inland valleys and coastal plains and spanned from Topanga Canyon (Los Angeles County) in the north to El Toro (Orange County) in the south, and included Catalina, San Clemente, and San Nicolas Islands in the Channel Islands and the San Gabriel and San Bernardino inland valleys in the east (McCawley, 1996).

Pre-European contact population numbers are difficult to assess due to discrepancies in the record; in 1852, Scottish born Los Angeles resident Hugo Reid published letters about the Gabrieleño lifeways; he believed there were some 68 villages, 28 of which he identified in Los Angeles County (McCawley, 1996:25). Each village was

reported to have contained an average of 100 people and McCawley (1996) offers an estimate of more than 5,000 Gabrieleños at the time of contact.

The pre-contact Gabrieleño practiced a patrilinear lineage system. Members of the lineage were given access to diverse resources held by the families within their lineage, allowing the Gabrieleño to exploit multiple ecologies. The heavily hierarchical Gabrieleño social system included elites, commoners, middle-class, the poor, and slaves. The elites were the only ones to possess access to religious items and the middle-class supported the elites.

Distribution of settlements did not fall into a consistent pattern throughout the Gabrieleño territory; this was in large part due to the diverse ecological zones within Gabrieleño territory, which was composed of coastal areas, islands, valleys, and foothills. However, there was a patterning to larger settlements; the archaeological record in Orange County contains abundant data regarding large village site distribution and function. Villages were placed where there was access to varying types of environments and resources, and a system of satellite camps stemming from main villages was then established for the specific procurement of resources. The level of use of these satellite campsites was in direct response to population and village size, as well as distance from the main village to the campsite (Earle and O'Neal, 1994).

Gabrieleño's subsistence strategies, which were similar to the Chumash strategies, incorporated seasonal procurement of resources, both terrestrial and marine. Throughout the year, individual Gabrieleño families would move to temporary encampments for hunting, harvesting, and collecting; depending on the season and resources that could be harvested, travel would occur through various ecological zones. In the interior, where primary habitation was thought to take place in the summers, deer and rabbit were significant resources amongst the Gabrieleño, who were expert hunters (McCawley, 1996). In spring and summer temporary camps would be established to gather roots, seeds, and bulbs; in the fall, acorns and other wild seeds were gathered as staples in the diet. In coastal areas that were less exposed to the elements, wintertime villages were occupied; satellite or temporary campsites would be erected near the shore to collect shellfish and other marine resources.

In addition to being expert terrestrial hunters, the Gabrieleño were adept at maritime subsistence and procurement, building planked canoes called *te'aat* that were sealed with pine pitch or asphalt, and hunting sea otters and other marine mammals with harpoons, as evidenced in the archaeological record from sites such as CA-LAN-2616 (Langenwalter et al., 2001).

Ethnographies have not consistently documented the indigenous groups of southern California. Often various tribes, such as the Chumash, the Gabrieleño, and the Luiseño, have been so intertwined that it becomes difficult for the researcher to distinguish one from the other in the written record.

2.3.3 Tataviam

The Tataviam spoke a language of the Takic branch of Uto-Aztecan stock (Native-Languages, 2009). Documentation is limited, but it is believed that the Tataviam migrated into the region approximately 1,500 years ago and were possibly an offshoot of the Serrano, although there is some debate on this point. The Tataviam occupied a territory that spanned from the Santa Clarita River to Piru Creek and from the Sawmill Mountains to the Antelope Valley (Higgins, 1996; Digital Desert, not dated [n.d.]).

The Tataviam were hunter-gatherers and like their Chumash neighbors, had permanent winter villages and seasonal temporary campsites used for resource gathering of plant foods such as acorns, seeds, berries, yucca, piñon nuts, and hunting deer and rabbit (Los Angeles County, 2008). Village location, whether permanent or satellite, was dictated by availability to water, favoring more reliable and permanent sources such as springs, rivers, and lakes (Los Angeles County, 2008). Household structures were composed of circular pit-houses with willow poles to shape the structure, which then were covered by grasses. Villages were placed on the southern sides of hills and mountains to optimize exposure to sunlight (California State Parks, 2011). Large villages contained dance and gaming areas, cemeteries, sweatlodges, granaries, and specialization areas, much like their neighbors.

Of the three groups who occupied the project area in pre-contact times, the Tataviam are the least known of all Native California groups (Johnson, 2006; Los Angeles County, 2008). What written information survives references

the Tataviam in generalizations and comparisons to their neighbors. Population estimates are at less than 3,000 at time of contact, but there is no feasible manner to accurately verify that information. When it comes to population estimates at the time of contact by Europeans, these numbers are approximations and no reliable data exist (Johnson, 2006). Little was recorded about the Tataviam culture during Spanish exploration and later missionization in the 1770s; what does survive of the native language was documented by John Peabody Harrington in the early 1900s. Mission records and other historic documents often failed to distinguish the Tataviam as an individual group when multiple tribes and languages where encountered; often ethnic affiliation was not distinguished or commented upon. Many of the Tataviam were relocated to the San Fernando Mission during historic times and were assimilated with other groups into an indistinct neophyte culture. The Tataviam language is no longer in use because there are no current Tataviam members who speak the native language. The last speaker died in 1916 (Native-Languages, 2009; Survey of California Other Native Languages, 2010).

2.4 History

Generally, the historic period begins with the first documented entrance by a European into a specific region. However, due to known contact in other parts of California by Russians, Chinese, Spanish, and Portuguese, some chronologies terminate the late prehistoric for all California in 1542, when the first documented European entered the territory now known as California; this period is termed the Protohistoric Period. In 1542, Juan Rodriguez Cabrillo explored the California coast by ship, entering San Diego Bay and claiming Alta California for Spain. Cabrillo landed near Point Magu in the same year. Sixty years later, Sebastian Vizcaino sailed into the San Diego Bay. Exploration of the land was slower to come. Don Gaspar de Portola searched Alta California for suitable mission sites in 1769.

In California, the historic era generally is divided into three periods: the Spanish or Mission Period (1769 to 1834), the Mexican or Rancho Period (1821 to 1848), and the American Period (1848 to present).

2.4.1 Spanish/Mission Period (1769 to 1834)

Gaspar de Portola was appointed as the first governor of California in 1767 and his first command by the Viceroy of Mexico was to expel the Jesuits from Baja California. This action prompted the launch of military and Franciscan expeditions from Baja California into the region, and with it, the official start of the historic period in California began. Following the expulsion of the Jesuits in Baja California, Spanish Colonial military outposts were established in Alta, the first of which was El Presidio Real de San Diego in 1769, with Pedro Fages as its commander. Military outposts continued to be built as expeditions travelled north. The Portola expedition of 1769 reached what would become Orange County on July 22, was in the San Gabriel Valley by August 2, and was passing through what would become Ventura County by the end of that month (Beebe and Senkewicz, 2001).

This period introduced the era of Missionization, an era of forced conversion of the Native Americans who occupied the region. During this period, 21 missions were built in California, lined up from south to north along El Camino Real; contemporary Highway 101 follows roughly the same alignment as El Camino Real. The first mission to be built in Alta California was San Diego de Alcala, founded by Junipero Serra on July 16, 1769. On March 31, 1782, Father Serra founded his last mission, the Mission San Buenaventura (San Buenaventura Mission, 2006). Mission Santa Barbara, the tenth mission to be established, was founded in December 1786 by the Franciscan Father Fermin Lasuen (California Missions Foundation, 2008). The Franciscans viewed the local populations as child-like individuals who would benefit from their European instruction and Christianization (We Are California, 2008). Captured and removed from their villages, the indigenous peoples were brought to the missions and into servitude. Many perished due to ill treatment, but more from the introduction of European diseases, which ultimately decimated the Native American populations (McCawley, 1996; We Are California, 2008).

In the 1790s, the Spanish government awarded land grants to soldiers and other Spanish *Californios* (Ventura Weekly, 2005); vast tracts of land were used for livestock and farming. In 1795, the Pico family was granted 45,729.6 ha (113,000 acres) in the area now known as Simi Valley; the *rancho* was named El Rancho Simi (Simi

History, n.d.). The name Simi was taken from the Chumash village name of *Shimiji,* which stood in the same location in pre-colonial times.

The last mission to be founded was San Francisco Solano in 1823. Further attempts to construct additional missions were thwarted by Spain itself due to the costly endeavor each new mission posed. Later, as Spain lost its rule over New Spain and secularization was sought by the new government, the mission system was disbanded (Weber, 2006).

2.4.2 Rancho Period (1821 to 1848)

Mexico became independent of Spain in 1821. In 1824, the Mexican government passed the Colonization Act in an effort to raise much needed funds by selling unoccupied lands in California. This law invited immigrants to settle in Mexico (including California) (Texas State Historical Association, 2012). However, much of the land in California belonged to the 21 missions and could not be sold by the new Mexican government. Through the Secularization Act of 1834, the governor secularized the missions of California, and the Mission land was placed under civil jurisdiction to be sold as land grants. This Act relegated the missions to only enough acreage for the church and its associated buildings and for land to support those who lived on mission property. The Secularization Act of 1834effectively ended the Mission Period in California.

The following years were marked by the proliferation of cattle ranching throughout the region, as the Mexican governor, Pio Pico, granted vast tracts of land to Mexican (and some American) settlers. The mission lands were opened for grants by the Mexican government to citizens who would colonize the area and develop the land, generally for grazing cattle and sheep (Lech, 2004). In Ventura County, there were 19 *ranchos*, comprising thousands of acres of land each (Galvin Preservation Associates, 2011).

In 1842, Jose de la Guerra y Noriega acquired the Pico family's Rancho Simi (California State Military Museum, n.d.). De la Guerra Y Noriega was one of the most prolific landowners and claimed more than 202,343 ha (500,000 acres), with ownership of land that extended from the southern end of San Luis Obispo County to the southern end of Ventura County (California State Military Museum, n.d.).

The war between the U.S. and Mexico, which began in 1846, ended with the Treaty of Guadalupe Hidalgo in 1848. Terms of the treaty established that property rights granted under the Mexican land grant system would be upheld. In 1850, California became a part of the U.S., ending Mexican control in the state. Court battles ensued over ownership of the missions and former mission property that had been divided into Mexican land grants (NPS, 2007).

2.4.3 American Period (1848 to Present)

Following the signing of the Treaty of Guadalupe Hidalgo in 1848, the U.S. took possession of California. The treaty bound the U.S. to honor the legitimate land claims of Mexican citizens residing in captured territories. On September 9, 1850, California became the thirty-first state in the Union (Moratto and Price, 2005). The Land Act of 1851 established a board of Land Commissioners to review these records and adjudicate claims, and charged the Surveyor General with surveying confirmed land grants. In order to investigate and confirm titles of California, American officials acquired the provincial records of the Spanish and Mexican governments that were located in Monterey. Those records, most of which were transferred to the U.S. Surveyor General's Office in San Francisco, included land deeds and sketch maps (Gutierrez and Orsi, 1998).

From 1852 to 1856, the board of Land Commissioners established the validity of grant claims. The commissioners rejected many of the original *rancho* claims, which then became public domain and fair game for squatters. Although the claims of some owners eventually were substantiated, many of the original owners lost their land to the U.S. Unsurveyed land boundaries created a loophole for squatters to occupy plots on the fringes of land grants. The squatters who occupied the land eventually came to own those plots through squatters' rights (Gutierrez and Orsi, 1998).

In the 1860s, Rancho Simi passed to the Philadelphia and California Petroleum Company and, in 1887, it was parceled off and a portion was bought by the Simi Land and Water Company. The general area around former

Rancho Simi became a town known as the Santa Susana Del Rancho Simi (Simi History, n.d.). By the end of the nineteenth century, a portion of the Rancho Simi adobe was still intact. The landowner, Robert Strathearn, restored the building and built onto the original structure; the Simi Adobe-Strathearn House is California Historic Landmark No. 979 and is listed in the NRHP.

Into the 1940s, the area on which SSFL is located was still used for ranching (NASA, 2009). After World War II, North American Aviation (NAA) purchased land that would be developed for rocket testing. In 1954, NAA purchased 339 ha (838 acres) from Henry Silvernale and Elizabeth Hall, which would later become part of NASA's Areas I and II (NASA, 2011).

2.4.4 Santa Susana Field Laboratory

The following is a brief summary of the detailed history of SSFL provided in the SSFL ICRMP (NASA, 2009) and the Historic Resources Survey and Assessment at SSFL (Archaeological Consultants, Inc. & Weitze Research [ACI and WR], 2009).

By the end of World War II, the Cold War had begun. This was a war fraught with political tension and a maintained military presence between the U.S. and its western allies and the Soviet Union and its allies; it would run from post-World War II (mid 1940s) through the early 1990s. The Cold War would be the catalyst for the missile program and other space developments to unfold.

In 1946, the Unites States Army, along with NAA, began to develop the Navaho guided missile. Following this contract between the two agencies, NAA began to test captured German missiles at the White Sands Proving Ground.

By the late 1940s, the U.S. Government and NAA had acquired the SSFL land and began research, development, and testing of liquid-fueled rocket engines. SSFL was divided into four management areas: Areas I, II, and III were reserved for rocket, munitions, and missile testing; Area IV was dedicated to nuclear power and development. Expansion of SSFL and rocket testing briefly was put on hold during the Korean War, resuming after the war with an increased demand.

The Rocket Engine Field Laboratory was built in the 1950s; in 1954, additional areas were developed for U.S. Department of Defense (DoD) programs and the Alfa, Bravo, Coca, and Delta test stands were constructed. In collaboration with NAA, the USAF established two Air Force Plants (AFPs) within the expanded SSFL acreage; these were managed as government-owned contractor-operated facilities. In 1956, the Rocket Engine Field Laboratory became known as the Propulsion Field Laboratory, and in 1957, it was changed to AFP 57, after the USAF took over the test facility.

SSFL became a renowned research and test facility and provided pivotal developments in rocket testing, weapons, and space travel; this included the Redstone rocket, the Apollo program, Atlas intercontinental ballistic missile; the USAF, Army, and NASA conducted testing at SSFL. In addition to the Navaho, Thor, and Atlas testings, Rocketdyne engineers also tested the Jupiter intermediate-range ballistic missile. The test stands for the missiles were distributed among the Alfa, Bravo, Coca, and Delta test stands, the ICRMP (NASA, 2009) states the following as the testing allocations:

> *Alfa test stands: Constructed during 1954-1955, the Alfa test site featured the first cluster of static test stands operational for AFP 57 at SSFL. Beginning in the mid-1950s, the Alfa test site supported early rocket engine static testing and provided pivotal data for the development and improvement of many weapons and space vehicle booster systems; Atlas on Alfa I (1955–1957), Atlas flight engine and Navaho engine on Alfa II (1956–1957), and firings of Thor (1955–1958), Atlas (1956–1957), Navaho (1956–1957), and Jupiter (1957) engines on Alfa III.*
>
> *Bravo test stands: Constructed during 1955-1956, the Bravo test site featured the second cluster of static test stands operational for AFP 57 at SSFL. The test stand site is associated with multiple static engine tests run between 1956 and 1991, beginning with tests of Atlas thrust chambers in 1956, and also supporting testing of F-1 components, Lunar Module Rocket Engine assemblies, and Atlas and Delta RS-27 vernier engines and turbopumps; Atlas (1956–1957) on Bravo I and II,*

developmental E-1 engine (1956–1959) on Bravo I, and static firing tests of the RS-2 on Bravo IIIB (1959).

Coca test stands: Constructed in 1955-1956, the Coca test site featured the third cluster of static test stands operational for AFP 57 at SSFL. Some of the facilities were modified or redesigned between 1962 and 1964; additional facilities were designed between 1972 and 1978. The test site is associated with multiple static engine tests run between 1956 and 1988, beginning with tests of Atlas and Navaho engines in the late 1950s; the J-2 engine in the 1960s in support of Saturn and Apollo; and the Space Shuttle Main Engine in the 1970s and 1980s in support of the Space Shuttle Program; Atlas engine on Coca I and II (1956–1957), Atlas engine on Coca II (1959), and a late version of the Navaho engine on Coca III (1956–1957).

*Delta test stands: Constructed in 1956, the Delta test site featured the fourth cluster of static test stands operational for AFP 57 at SSFL; Atlas on Delta III in 1957, static firings of the Jupiter engine on Delta I (1960–1963), and experimental Air Force rocket engines, including firings of the E-1 engine (1958–1960), the X-1 engine (1958–1961), and the X-4 engine (1960) on Delta II (*NASA, 2009).

In addition to these developments, in 1958, the Jupiter C rocket with a Redstone engine took the Explorer I, the first American satellite into orbit; also in 1958, the Saturn I program was started. In 1961, the Mercury capsule, with an adapted Redstone engine, was launched and the Saturn Apollo program was initiated.

The period of major testing at SSFL occurred from 1950 through the 1970s; at the height of the testing during the 1960s, NASA was given to lease the AFP 57 to support the Apollo program. NASA operated many facilities within SSFL, and by 1966, four new structures within the Coca test area were built; modifications to existing structures in the Bravo and Delta test areas also were made.

Planning for the Space Shuttle Main Engine was begun in 1969 and Rocketdyne was chosen to initiate and develop the engine. To support the testing, in 1972, a high-pressure gas storage vault was added to the Coca Test area.

The period of major testing occurred from 1950 through the 1970s. In 1973, Area II and a section of Area I were transferred to NASA from the USAF.

Use of the test site areas varied and changed from decade to decade; by the 1980s, NASA had begun to shut down testing activities and only a few active locations continued into the 2000s. The Alfa test area continued to testing of Atlas MA-5 engines until 2000 and the Delta RS-27 and RS-27 until 2006; the Bravo test area continued to test the Delta RS-27 and Atlas until 2005; the Coca test area continued to test the Space Shuttle Main Engine until 1988; the Delta test area continued to test engines until 1974, when it was deactivated.

Today, SSFL is composed of government-owned, contractor-owned/contractor-operated, and corporate enterprise facilities, and facilities operated by the U.S. Department of Energy on land it leases from Boeing. NASA has discontinued rocket testing, and in 2007 and 2010, orders were issued to conduct environmental cleanup of NASA-administered property in LOX Plant Area I and Area II.

SECTION 3

Previous Investigations

3.1 Archival Research

Literature searches were conducted at the South Central Coastal Information Center (SCCIC) at California State University–Fullerton for this project. Literature searches were conducted first in 2006. An updated literature search was conducted on July 12, 2011, for the NASA-administered portion of SSFL (Area I [LOX Plant Area] and Area II); a 1-mile undeveloped area around the NASA-administered property at SSFL was included in this research. A subsequent records search was conducted at SCCIC in February 2013 for an additional 9 acres of land on Boeing property just north of the NASA-administered area. The literature searches at the SCCIC provided data regarding documented studies submitted to the SHPO. Data also were provided by NASA regarding previous investigations and previously recorded resources. Table 2 lists previous studies conducted within the APE. The ACI and WR report (2009) was furnished by NASA and, therefore, does not have a California Historical Resources Information System (CHRIS) catalogue number. Multiple cultural resources studies have been conducted within the APE. Table 3 lists previously recorded historic properties within the APE and their NRHP status. Table 4 summarizes previously identified cultural resources within 1 mile of the APE.

TABLE 2
Cultural Resources Studies Previously Conducted within the APE
Cultural Resources Study for Environmental Cleanup and demolition for SSFL, NASA Areas I and II

Report Authors and Date	CHRIS Catalogue Numbers
Fenenga (1973)	VN-00211
Romani, Larson, Romani and Benson (1988)	VN-01027
Rozaire (1959)	VN-01039
Edberg (n.d.)	VN-01051
Romani, Romani and Larson (n.d.)	VN-01052
Redtfeldt (1979)	VN-01058
Atwood (1991)	VN-01072
La Monk (n.d.)	VN-01089
Knight (1993)	VN-01406
Gutman et al. (1970)	VN-01446
King and Parsons (1999)	VN-02239
Craft and Mustain (2007)	VN-02607
Emmick and Bard (2008)	VN-02711
Romani (2009)	VN-02797
McClintock, Wilt and Emmick (2009)	VN-02719
Knight (1999)	VN-02888
Hogan and Tang (2010)	VN-02889
ACI and WR (2009)	N/A

Notes:
CHRIS = California Historical Resources Information System
n.d. = no date made available
N/A = not applicable
Source: CHRIS South Central Coastal Information Center; NASA

TABLE 3
Previously Recorded Historic Properties in the APE
Cultural Resources Study for Environmental Cleanup and Demolition for SSFL, NASA Areas I and II

Site Number	Site Description	NRHP/CRHR
56-001072/CA-VEN-1072	Burro Flats Painted Cave	Listed
56-001800/CA-VEN-1800	Rock Shelter	Potentially Eligible
56-001803/CA-VEN-1803	Lithic Scatter	Potentially Eligible
Not assigned	Alfa Test Area Historic District	Eligible
Not assigned	Bravo Test Area Historic District	Eligible
Not assigned	Coca Test Area Historic District	Eligible

Notes:
APE = area of potential effects
CRHR = California Register of Historical Resources
NRHP = National Register of Historic Places
Source: CHRIS South Central Coastal Information Center and NASA

TABLE 4
Previously Recorded Resources within 1-mile of the APE
Cultural Resources Study for Environmental Cleanup and Demolition for SSFL, NASA Areas I and II

Site Number	Site Description	NRHP/CRHR
56-000162	3 Rockshelters	Not evaluated
56-000711	Bedrock Mortars and Cupules	Not evaluated
56-000712	Lithic Scatter	Not evaluated
56-000730	Cave Occupation	Not evaluated
56-000731	Rock Shelter	Not evaluated
56-000732	Rock Shelter	Potentially Eligible
56-000733	Rock Shelter	Not Eligible
56-000763	Rock Shelter	Not evaluated
56-000764	Rock Shelter	Not evaluated
56-001050	Rock Shelter	Not evaluated
56-001017	Lithic Quarry	Not evaluated
56-001119	Bedrock Mortars	Not evaluated
56-001302	Lithic Scatter	Not evaluated
56-001303	Historic Structure	Not evaluated
56-001772	Historic Pictograph	Not evaluated
56-001773	Rock Shelter	Not evaluated
56-001772	Bedrock Mortar	Not evaluated
56-001775	Rock Shelter/Bedrock Mortar	Not evaluated

TABLE 4
Previously Recorded Resources within 1-mile of the APE
Cultural Resources Study for Environmental Cleanup and Demolition for SSFL, NASA Areas I and II

Site Number	Site Description	NRHP/CRHR
56-001779	Historic Culvert	Not evaluated
56-001804	Lithic Scatter	Not evaluated
56-001805	Lithic Scatter, Cistern & Possible Rock Shelter	Not evaluated
56-152837	Historic Building	Not evaluated
19-000253	Rock Shelters	Eligible
19-000247	Historic Kilns	Not evaluated
19-000502	Lithic Scatter	Not evaluated
19-000503	Lithic Scatter	Not evaluated
19-000504	Lithic Scatter	Not evaluated
19-000647	Bedrock Mortars	Not evaluated
19-000648	Historic Structures	Not evaluated
19-000832	Rock Shelters	Eligible
19-001536	Rock Shelter/Midden with Diagnostics	Eligible
19-001537	Rock Shelter with Midden	Not Eligible
19-001538	Rock Shelter with Midden	Eligible
19-001539	Rock Shelter with Midden	Potentially Eligible
19-001541	Lithic Scatter	Not eligible
19-001606	Rock Shelter	Not eligible
19-001607	Rock Shelter	Not eligible
19-001608	Historic Structure with Refuse	Eligible
19-001696	Rock Shelter	Not evaluated
19-002930	Campsite	Not evaluated
56-100471	Isolated piece of shatter	Not eligible
56-100472	Isolated flake	Not eligible
56-100473	Isolated core	Not eligible

Notes:
APE = area of potential effects
CRHR = California Register of Historical Resources
NRHP = National Register of Historic Places
Source: CHRIS South Central Coastal Information Center

3.2 Field Inventory Methodologies

The APE has been subject to multiple episodes of field surveys to locate and document prehistoric, historic, and architectural resources.

The first in a series of intensive, systematic pedestrian cultural resource surveys within the APE was conducted in June 2007, followed by another investigation in February 2008 of NASA's LOX Plant Area I and Area II (Emmick and Bard, 2008). Methodologies for these field investigations employed the use of site records to relocate known resources and mapping using global positioning system (GPS) units. Pedestrian transects alternated between 15 m (49.2 ft) and 30 m (98.4 ft) due to uneven, steeply sloped terrain. All rock outcrops were investigated for use, because rock shelters are known to occur throughout the Bell Canyon region. This investigation resulted in the full recordation of Burro Flats Painted Cave and in the discovery of one new site, CA-VEN-1800. In June 2009, a supplemental survey of approximately 4.9 ha (12 acres) was conducted in the LOX Plant Area I using the same survey methodologies as in the 2007/2008 study (McClintock, Wilt, and Emmick, 2009); no additional resources were discovered during this investigation. To complete the surface inventory of the APE, an intensive, systematic pedestrian cultural resource survey of an additional 30.4 ha (75 acres) within the NASA-administered property at SSFL was conducted from October 24 through October 28, 2011. NASA arranged for Mr. Randy Guzman-Folkes of R. Indigenous Consultants Tribal Monitoring to be present during the 2011 archaeological field survey.

The topography of the APE is relatively hilly terrain. SSFL is located at the crest of the Simi Hills, which constitute the foothills to the Santa Monica Mountains. Topographic elevations range from 503 to 663 m (1,650 to 2,175 ft) with ridges, canyons, rocky uplands, deep alluvial channels, drainages, ravines, and washes. Because of the rugged terrain typical throughout the NASA-administered property of SSFL, including severe drops, ravines, and other inaccessible terrain, traditional 15-m (49.2 ft) transects were not feasible in all areas. Where pedestrian navigation was feasible, transects spaced at 15-m (49.2-ft) intervals were conducted. Areas with greater than a 25-percent slope (shown in Figure 2, the APE) were surveyed slightly differently because of the steep slope. Equally spaced transects were not always feasible in the greater than a 25-percent slope areas because of unsafe terrain. In areas where the slope was greater than 25 percent, reconnaissance level survey was employed. In steep areas, particular attention was given to outcrops and overhangs because known rockshelters are located within Area II (Figures 5 and 6). Subsurface exposures, including rodent burrows and cut banks, were examined. Ground visibility throughout the survey area ranged from 0 to 75 percent because of the dense woodland scrub, a carpeting of poison oak, and other vegetation. Disturbances to the survey area consist of construction and demolition, NASA and Boeing facilities, roads, parking lots, maintenance, utilities, water and erosion control, and test areas with their associated activities.

FIGURE 5
NASA Area II
October 2011
Cultural Resources Study for Environmental Cleanup and Demolition for SSFL, NASA Areas I and II

FIGURE 6
NASA Area II Rock Outcrop
October 2011
Cultural Resources Study for Environmental Cleanup and Demolition for SSFL, NASA Areas I and II

For the October 2011 archaeological survey, the crew navigated via a Trimble Geo XH GPS unit. The GPS unit contained the survey area shape files, the previously recorded site boundaries, and the previously recorded resources. Appendix A contains representative photographs of the APE from this 2011 survey.

With the completion of the October 2011 survey, the entire 182.5-ha (451.2-acre) NASA-administered property at SSFL has been investigated for cultural resources. In addition to the 182.5 ha (451.2 acres) of NASA property, 15.7 ha (39 acres) of adjacent Boeing property were surveyed because NASA's cleanup activities likely would extend into these areas. The October 2011 survey resulted in 100 percent of the APE (Figure 2) having been surveyed for cultural resources.

For the purpose of defining a site, the guidelines provided in the California Office of Historic Preservation's (OHP's) *Information Center Procedural Manual* (1995), which defines a site as the location of a prehistoric or historic occupation or activity, were used. Per this definition, and following OHP guidelines, areas with five or more items are recorded as sites, while areas with four or less items are recorded as Isolated Finds. Features are recorded as sites. Resources separated by more than 50 m (164 ft) or located on different landforms generally are recorded as distinct sites or as isolates.

Cultural resources consisting of new sites and isolated finds were recorded on appropriate Department of Parks and Recreation (DPR) forms, mapped using a Trimble Geo XH GPS, and photographed. Information regarding the appearance and physical characteristics of the resources, as well as their locations, was gathered and included on the appropriate DPR forms. No artifacts were collected during any episode of survey; they were mapped and photographed in place.

In addition to archaeological investigations, NASA-administered properties at SSFL have been surveyed for architectural resources. In 2007, a historic resources survey and assessment of NASA-administered Areas I and II

was performed to identify and evaluate NASA-owned facilities. The methodology employed in this study included the following archival research: historic documents and photographs at the Marshall Space Flight Center History Office, Huntsville, Alabama; the Air Force Historical Research Agency, Maxwell Air Force Base, Montgomery, Alabama; the Rocketdyne Historic Photograph Collection at SSFL; the Boeing Company office in Canoga Park, California; and the DMJM office in Los Angeles, California. Interviews with current and former employees of Rocketdyne and Boeing also were conducted as a part of this investigation.

The field survey of buildings and structures in NASA-administered LOX Plant Area I and Area II was conducted from August 13 to 18, 2007, and facilities were documented via description and photography (ACI and WR, 2009). According to the 2009 report, structures within the survey area were evaluated for NRHP-eligibility. As a result of this study, three historic districts were documented: the Alfa, Bravo, and Coca Test Area Historic Districts, as well as nine individually eligible structures (ACI and WR, 2009).

3.3 Results of Investigations

Archaeological site CA-VEN-1072, the Burro Flats Painted Cave, has been thoroughly re-recorded and sites CA-VEN-1800 and CA-VEN-1803 previously were documented. The 2011 investigation found no additional archaeological resources. Three historic districts, the Alfa, Bravo, and Coca Test Areas, were documented in 2007 .

3.3.1 Archaeological Resources

3.3.1.1 Site No. CA-VEN-1072 (Primary 56-001072), also CA-VEN-151, -152, -153, -154, -155, -156, -157, -158, -159, -160, -161, -1065, -1066,-1067, and -1069; also known as "Burro Flats Painted Cave"

The Burro Flats Painted Cave was listed in the NRHP and the CRHR in May 1976. The Burro Flats Painted Cave site was first recorded in 1959 (Rozaire, 1959). At that time, NRHP significance criteria had not been developed. The NRHP website indicates that the site is significant for its informational potential, which today would be Criterion D (NRHP, 2013).

The prehistoric archaeological site consists of pictographs or rock art paintings; petroglyphs, which are rock art that has been scored or incised into the rock surface; mortars; tooling; and habitat. Researchers such as Romani and Larson (1985) and McCawley (1996) have described the site as an astronomical observatory and have associated it with the celebration of the winter solstice. This interpretation from an archaeoastronomical context is well established and accepted in the archaeological community (Gilreath, 2007). The Chumash of the Simi Valley and Simi Hills and the Gabrieleño of the San Fernando Valley, as well as the Tataviam, may have visited the Burro Flats Painted Cave area. The site encompasses approximately 7 ha (17.3 acres) in the NASA-administered areas of SSFL. The period of significance of the cave is believed to be 1000 to 1499 A.D. However, recent analysis of the artifact assemblage recovered from excavation investigations has resulted in the assertion that occupation of this site has been ongoing for approximately 5,000 years (King, 2012).The earliest documented investigations at Burro Flats Painted Cave began in 1953, with excavations carried out by the Archaeological Survey Association of Southern California, which made five trips to the site between 1953 and 1954.

The Burro Flats Painted Cave includes several panels of pictographs and petroglyphs in sandstone rock shelters. It also includes many bedrock milling features that would have been used for grinding acorns, and smaller cupules that may have been used for processing food or served an aesthetic function. Much of the site consists of midden, which is debris associated with human habitation. While documenting the middens at the site, Rozaire (1959; 1960a) noted that they consisted of debitage, burned bone, and shell fragments. Rozaire also excavated a cremation burial that revealed a mortuary practice used by the Gabrieleño.

The site had been documented under numerous separate listings, and some misidentifications of elements and some inconsistencies in function, assemblage, and design interpretations had been recorded. Because of these inconsistencies, a revisit and a complete recordation of the site's elements were warranted. In June 2007, the site was re-recorded and the DPR forms updated; this effort combined 16 separately recorded sites into a single site

(CA-VEN-1072) with associated loci and features. Table 5 lists the sites and loci from previous investigations that have been re-recorded and consolidated into the single site CA-VEN-1072 (Primary 56-001072).

TABLE 5
Site CA-VEN-1072: Cross-Reference for Site Numbers, Loci, Galleries, and Features
Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Rozaire Site #	Knight #	Fenenga #	Description
CA-VEN-151	Locus 1		Midden
CA-VEN-152	Locus 2		Midden
CA-VEN-153	Locus 3		Midden
CA-VEN-154	Locus 4		Midden
CA-VEN-155	Locus 5a	Feature 4	Bedrock milling features
CA-VEN-155	Locus 5b	Feature 5	Bedrock cupules
	Locus 5c	Feature 7	Bedrock milling features and cupules
CA-VEN-156	Locus 6	Gallery 2	Pictographs, Bedrock milling features
CA-VEN-157	Locus 7		Pictographs, Petroglyphs
CA-VEN-158	Locus 8	Gallery 3	Pictographs
CA-VEN-159	Locus 9	Gallery 1B	Pictographs
CA-VEN-160	Locus 10	Gallery 1A	Pictographs, Petroglyphs, Bedrock cupules
CA-VEN-161	Locus 11	Gallery 5 (Whitley)	Pictographs
CA-VEN-1065	Locus 12		Rock shelter
CA-VEN-1066	Locus 13		Rock shelter, Pictographs
CA-VEN-1067	Locus 14		Bedrock trail to cistern
CA-VEN-1068	Locus 15		Bedrock milling features
	Locus 16	Gallery 1C (Whitley)	Pictographs
	Locus 17	Gallery 4	Pictographs
	Locus 18a	Feature 1	Bedrock milling features
	Locus 18b	Feature 1	Bedrock milling features
	Locus 19	Feature 2	Bedrock milling feature
	Locus 20	Feature 3	Bedrock milling features
	Locus 21	Feature 6	Bedrock milling feature
	Locus 22	Feature 8	Bedrock milling features
	Locus 23		Pictographs
	Locus 24	(Noted by Fenenga)	Rock shelter

Sources: Rozaire (1959, 1960a-j); Knight (1991a-f); Fenenga (1973); Whitley (2007)

3.3.1.2 Site No. CA-VEN-1800 (Primary 56-001800)

This site is a rock shelter that was first recorded in June 2007 (Emmick and Bard, 2008). The western alcove has a maximum depth of 5.6 m (18.4 ft) and a maximum width of 5.9 m (19.4 ft), while the eastern alcove has a maximum depth of 3.4 m (11.2 ft) and a maximum width of 6.7 m (22 ft). The site measures 30 by 15 m (98.4 by 49.2 ft). Three lithic artifacts were observed at the site–a proximal-medial fragment of a stage three perform, a large chopper, and a core with at least two lateral edges exhibiting dulling from use as a chopping implement.

During the initial evaluation of this site, it was deemed to retain integrity of location, design, setting, materials, and workmanship. The site was recommended eligible for listing in the NRHP under Criterion D pending further study, because of its potential to yield information important to prehistory. The California SHPO reviewed this recommendation as part of a Section 110 consultation in February 2009. The SHPO commented that the sparse collection of artifacts and lack of features appeared to indicate that the site had been used only rarely and could represent a single episode of use. SHPO did not concur with the finding that CA-VEN-1800 was eligible for listing in the NRHP. SHPO recommended the site be treated as potentially eligible for all undertakings. NASA responded on April 23, 2009, agreeing to treat CA-VEN-1800 as potentially eligible for listing in the NRHP for any undertakings.

3.3.1.3 Site No. CA-VEN-1803 (Primary 56-001803)

In 2010, a cultural resources assessment was completed for 73.6 ha (182 acres) on the Northern Undeveloped Area on Boeing property, located on the hillside overlooking SSFL to the south. The assessment included a literature search and a pedestrian survey. This assessment, VN-02889 (Hogan and Tang, 2010), overlaps with 3.6 ha (9 acres) of the current APE. One archaeological site, CA-VEN-1803, which was identified during this investigation, is sparse lithic scatter and extends a few meters into the current APE.

The site has seven lithic artifacts, including four secondary flakes and three multidirectional cores. The lithic material observed at this site is quartzite. Much of the ground visibility in the area is limited by thick vegetation. The site is in good condition and there is a possibility that the site has an intact subsurface component.

Hogan and Tang (2010) state:

> *The archaeological data potential of Sites 56-001803 through 56-001805 largely depends upon the presence or absence of subsurface cultural deposits. Therefore, their historical significance and qualifications as historical properties under Section 106-cannot be determined without further archaeological investigations, including subsurface testing* (Hogan and Tang, 2010).

Therefore, the site is recommended as potentially eligible for listing in the NRHP under Criterion D pending further study, because of its potential to yield information important to prehistory. The California SHPO has not yet reviewed this recommendation.

3.3.2 Historic Architectural Resources

In 2007, ACI conducted an assessment of the built environment within NASA-administered LOX Plant Area I and Area II of SSFL. This survey assessed 135 federally owned buildings, structures, and sites. ACI and WR identified one structure, a well, in Area I, but there is also a truck scale with a small operators shed in Area I, which are owned by Boeing (NASA, 2013). The remaining surveyed structures were all in Area II. The survey results indicated that 60 of the structures within Area II are temporary; small storage sheds, roadways, pipelines, and objects such as light fixture poles that are generic in use. The results of this investigation identified three historic districts–the Alfa, Bravo, and Coca Test Areas–and nine structures within the districts that are considered individually eligible for listing in the NRHP (ACI and WR, 2009).

3.3.2.1 Alfa Test Area Historic District

The Alfa Test Area Historic District was recorded as part of the historic resource assessment survey conducted in August 2007 (ACI and WR, 2009). The Alfa Test Area Historic District is eligible for listing in the NRHP under Criterion A for its association with early rocket testing and development and under Criterion C for its engineering and design. The district contains 18 buildings, of which 10 are contributing resources. Constructed during 1954-1955, the Alfa test site featured the first cluster of static test stands operational for AFP 57 at SSFL. Beginning in

the mid-1950s, the Alfa test site supported early rocket engine static testing and provided pivotal data for the development and improvement of many weapons and space vehicle booster systems (Criterion A). The Alfa Test Area Historic District is also eligible under Criterion C for the design and engineering of the test site. The district includes the test stands and blockhouse, ancillary buildings and structures, and elements of the natural and fabricated landscape. Within the historic district, 3 of the 10 contributing structures also were determined individually eligible for the NRHP. The Alfa Control House (Building 208), Alfa I Test Stand, and Alfa II Test Stand were documented as each individually meeting the NRHP criteria for eligibility in the context of the Cold War (Military) and Space Exploration, under Criterion A for their exceptionally important role in the development and testing of various rocket engines, and under Criterion C for their specialized engineering and design. Because they have achieved exceptional importance within the past 50 years, Criteria Consideration G applies, as well. SHPO concurred on May 15, 2008, with the eligibility of the historic district and its contributing elements, as well as with the individual eligibility of the three structures.

3.3.2.2 Bravo Test Area Historic District

The Bravo Test Area Historic District was surveyed as part of the historic resource assessment conducted in August 2007 (ACI and WR, 2009). The Bravo Test Area Historic District contains 10 buildings, 8 of which are contributing resources. Constructed during 1955-1956, the Bravo test site featured the second cluster of static test stands operational for AFP 57 at SSFL. Under Criterion A, the district is eligible for listing in the NRHP for its associations with multiple static engine tests run between 1956 and 1991, beginning with tests of Atlas thrust chambers in 1956, and also supporting testing of F-1 components, Lunar Module Rocket Engine assemblies, and Atlas and Delta RS-27 vernier engines and turbopumps. The Bravo Test Area Historic District also is significant under Criterion C for the design and engineering of the test site. The district includes the test stands and blockhouse, ancillary buildings and structures, and elements of the natural and fabricated landscape. Within the historic district, three of the eight contributing structures were determined individually eligible for the NRHP. The Bravo Control House (Building 213), Bravo I Test Stand, and Bravo II Test Stand were documented as each individually meeting the NRHP criteria for eligibility in the contexts of the Cold War (Military) and Space Exploration, under Criterion A for their exceptionally important role in the development and testing of various rocket engines, and under Criterion C for their specialized engineering and design. Because they have achieved exceptional importance within the past 50 years, Criteria Consideration G applies, as well. SHPO concurred on May 15, 2008, with the eligibility of the historic district and its contributing elements, as well as with the individual eligibility of the three structures.

3.3.2.3 Coca Test Area Historic District

The Coca Test Area Historic District was recorded as part of the historic resource assessment survey conducted in August 2007 (ACI and WR 2009). The district contains 27 buildings, 18 of which are contributing resources. Constructed in 1955-1956, the Coca test site featured the third cluster of static test stands operational for AFP 57 at SSFL. Some of the facilities were modified or redesigned between 1962 and 1964; additional facilities were designed between 1972 and 1978. Under Criterion A, the Coca Test Area Historic District is eligible for listing in the NRHP for its associations with multiple static engine tests run between 1956 and 1988, beginning with tests of Atlas and Navaho engines in the late 1950s; the J-2 engine in the 1960s in support of Saturn and Apollo; and the Space Shuttle Main Engine in the 1970s and 1980s in support of the Space Shuttle Program. The Coca Test Area Historic District is also significant under Criterion C for the design and engineering of the test site. The district includes the test stands (Figure 7) and blockhouse, ancillary buildings and structures, and elements of the natural and fabricated landscape. Within the historic district, 3 of the 18 contributing structures were determined individually eligible for the NRHP. The Coca Control Center (Building 218), Coca I Test Stand, and Coca IV Test Stand were documented as each individually meeting the NRHP criteria for eligibility in the contexts of the Cold War (Military) and Space Exploration, under Criterion A for their exceptionally important role in the development and testing of various rocket engines, and under Criterion C for their specialized engineering and design. Because the district and structures have achieved exceptional importance within the past 50 years, Criteria Consideration G applies, as well. SHPO concurred on May 15, 2008, with the eligibility of the historic district and its contributing elements, as well as with the individual eligibility of the three structures.

FIGURE 7
NASA Area II Coca Test Stands
October 2011
Cultural Resources Study for Environmental Cleanup and Demolition for SSFL, NASA Areas I and II

SECTION 4

Consultation

4.1 Native American Consultation

4.1.1 Native American Heritage Commission

NASA contacted the Native American Heritage Commission (NAHC) in June 2011 to request information about traditional cultural properties in the SSFL area and tribal representatives in the region. The NAHC responded on June 10, 2011, with a list of Native Americans interested in consulting on development projects. A second inquiry was sent to NAHC in April 2012 and an updated list of Native Americans with an interest in the region was sent to NASA. The correspondence between NASA and NAHC is included in the consultation record.

4.1.2 Tribal Outreach

NASA is conducting formal government-to-government consultation with Native Americans for this undertaking. On June 30, 2011, each of the 15 individuals and groups listed by NAHC, representing both federally recognized and non-federal interested tribes, was contacted by letter. The letter notified the tribes of NASA's intent to use the NEPA process and documentation to comply with Section 106, in accordance with 36 CFR 800.8, and to seek input regarding concerns that might be unique to each tribe. On September 30, 2011, NASA mailed a historic structures assessment package to the Santa Ynez Band of Chumash Indians and in May 2012, sent a map of the APE for the tribe's review. NASA received an e-mail response on July 12, 2012, from the Santa Ynez Band of Chumash Indians requesting to participate as a Section 106 consulting party and a letter on September 19, 2012, formally requesting consultation. Consultation with the federally recognized Santa Ynez Band of Chumash Indians and other tribes is ongoing. The consultation will include consideration of flora and fauna in the APE that have known cultural uses to the Santa Ynez Band of Chumash Indians. Appendix B contains a summary of the consultation record through April 4, 2013.

NASA has met with the Santa Ynez Band of Chumash Indians regarding the sacred site designated in December 2012. NASA continues consultation with the Santa Ynez regarding potential impacts to the sacred site and measures to mitigate the impacts on the sacred site. This consultation is confidential and is not included in Appendix B due to the sensitive nature of the sacred site.

Native Americans in the region are being contacted as a part of the Traditional Cultural Property and Cultural Landscape Assessment currently under way. They are being interviewed as a part of this investigation and evaluation. The report of these findings will remain confidential.

4.2 Section 106 Consultation

NASA formally initiated NHPA Section 106 consultation with the California SHPO and the ACHP on June 30, 2011. The initiation letter notified SHPO and ACHP of NASA's intent to use the NEPA process and documentation to comply with Section 106, in accordance with 36 CFR 800.8. On July 20, 2011, the ACHP responded to NASA by letter, confirming that it would participate in the consultation process. On August 5, 2011, the SHPO telephoned and sent an e-mail confirming its participation in the consultation. The consultation letters are summarized in Appendix B and are included in the consultation record.

NASA held the first Section 106 consulting party meeting with the identified consulting parties on March 1, 2012. The purpose of the meeting was to introduce the project to the consulting parties and to present information about the project, including the proposed APE, NASA's Proposed Action, and the identified historic properties that potentially would be affected by the project. This meeting, held at SSFL, also included a tour of the site.

Participants in the first Section 106 meeting included the following consulting parties: Mark Beason, William Preston Bowling, Wayne Fishback, John Luker, Tom McCulloch, Mark Osokow, Chris Rowe, Susan Stratton, Barbara Tejada,

Christina Walsh, Abraham Weitzberg, and Ronald Ziman. Others in attendance at the meeting included Jim Biederman and Maureen Sheehan with the General Services Administration. Meeting minutes were posted on the SSFL Environmental Cleanup and Closure public website (http://ssfl.msfc.nasa.gov) on August 23, 2012, and the parties were notified the minutes were available for review.

There is an application process in place for individuals or groups who would like to become consulting parties. Several parties have applied to be consulting parties and have been accepted by NASA since the first meeting in March 2012. These include Carla Bollinger, Gary Brown, Nicole Doner, Beverly Folkes, Elizabeth Harris, Luhui Isha, Nancy Kidd, Christian Killkkaa, Albert Knight, Dan Larson, John Tommy Rosas, Bruce Rowe, Alan Salazar, Margie Steigerwald, Clark Stevens, Mati Waiya, and Mary Wiesbrock. Table 6 lists the participating consulting parties and affiliated organizations as of April 4, 2013. Appendix B contains a summary of the consultation and relevant correspondence between NASA and the consulting parties.

There have been two consultation meetings since the first one held on March 1, 2012 at SSFL. On October 30, 2012, the second consultation meeting was held via teleconference. The NEPA in lieu of Section 106 consultation process was discussed, as was the simultaneous, yet largely confidential, Native American consultation process. The APE and potential soil cleanup areas were reviewed. Primarily, NASA was soliciting ideas and suggestions for potential measures to minimize impacts to historic properties and measures to mitigate the adverse effect on historic properties from the undertaking. A bullet list summary of the issues discussed at the meeting was circulated to the consulting parties for comment before the more detailed meeting summary was submitted. NASA requested comments and suggestions by December 1, 2012. The finalized meeting notes were posted on the SSFL website on January 31, 2013.

The third consultation meeting was held at SSFL on March 15, 2013, with some people participating via teleconference. The meeting discussed the definitions of traditional cultural properties and cultural landscapes. NASA also notified the consulting parties of the upcoming Traditional Cultural Property and Cultural Landscape Assessment that will include interviews of local, state, and national tribal members in the area. NASA solicited suggestions and contact information for people to be interviewed as a part of this investigation. Two consulting parties, Wayne Fishback and Christina Walsh, gave brief presentations to the group. The meeting summary will be distributed to the consulting parties for comment and subsequently posted on the SSFL website when finalized.

NASA has met with or communicated with SHPO, ACHP, and Section 106 consulting parties at strategic points of the EIS planning process to review project data, to discuss the APE, to identify historic properties, and to discuss measures to mitigate adverse effects on cultural, historic, archaeological, and Native American resources that could result from the Proposed Action. As part of this process, there have been additional electronic communications regarding the proposed APE for comment (in May 2012); the final APE (October 2012); dispersal of meeting notes for comment; and consulting party comments on meetings, announcements, or issues raised at meetings. There will be additional consulting party meetings to discuss effects on historic properties from the federal undertaking, as well as measures to resolve adverse effects on historic properties. This consultation will continue after the draft EIS is released to the public. Ultimately, the consultation process will culminate in appropriate measures to address effects on historic properties. The Record of Decision (ROD) will be the document formalizing the agreement among the parties.

TABLE 6
Santa Susana Field Laboratory Environmental Cleanup Section 106 Consulting Parties
Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

First Name	Last Name	Organization
Mark	Beason	California Office of Historic Preservation
Carla	Bollinger	Santa Susana Mountain Park Association
Bill	Bowling	Aerospace Contamination Museum of Education
Gary	Brown	National Park Service, Santa Monica Mountains National Recreation Area
Sam	Cohen	Santa Ynez Band of Chumash Indians
Nicole	Doner	Ventura County Cultural Heritage Board
Wayne	Fishback	NA
Beverly	Folkes	Native American Monitoring Group
Elizabeth	Harris	NA
Luhui	Isha	NA
Nancy	Kidd	Simi Valley Historical Society
Christian	Kiillkkaa	NA
Albert	Knight	NA
Dan	Larson	Compass Rose Archaeological
John	Luker	Santa Susana Mountain Park Association
Tom	McCulloch	Advisory Council on Historic Preservation
Mark	Osokow	San Fernando Valley Audubon Society
Gwen	Romani	Compass Rose Archaeological
Freddie	Romero	Santa Ynez Band of Chumash Indians
John Tommy	Rosas	Tongva Ancestral Territorial Tribal Nation
Bruce	Rowe	NA
Chris	Rowe	NA
Alan	Salazar	NA
Margie	Steigerwald	National Park Service
Clark	Stevens	Resource Conservation District of the Santa Monica Mountains
Susan	Stratton	California Office of Historic Preservation
Barbara	Tejada	Ventura County Archaeological Society
Mati	Waiya	NA
Christina	Walsh	cleanuprocketdyne.org
Abraham	Weitzberg	NA
Mary	Wiesbrock	Save Open Space
Ronald	Ziman	NA

Notes:
NA = not applicable
Accepted consulting parties as of April 4, 2013.

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SECTION 5

Historic Properties

5.1 Standards of Significance

Standards of significance for cultural resources in the APE were identified using standards from the following sources:

- National Register Bulletin 15–*How to Apply the National Register Criteria for Evaluation* (NPS, 1990a)
- *Instructions for Recording Historical Resources* (OHP, 1995)

The protection of historic properties is governed by several federal laws and regulations, including the NHPA (1966), the Archaeological and Historic Preservation Act (1974), the American Indian Religious Freedom Act (1978), the Archaeological Resources Protection Act (1979), and the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) (1990).

Under Section 110 of the NHPA, historic properties under the jurisdiction or control of a federal agency must be identified and evaluated for listing in the NRHP. Section 106 of the NHPA states that federal agencies must take into account the effect of the undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the NRHP.

The enabling legislation for Section 106 is contained in 36 CFR 800, "Protection of Historic Properties." The Section 106 process entails three basic steps:

1. Identify historic properties potentially affected by the undertaking.
2. Assess adverse effects on historic properties.
3. Seek ways to avoid, minimize, or mitigate adverse effects on historic properties.

In accordance with 36 CFR 800, determinations regarding the potential effects of an undertaking on historic properties are presented to SHPO, federally recognized Native American tribes, and other interested parties. The effects analysis and findings for this Proposed Action are presented in Section 4 of the EIS and are not included in this report.

Under Section 106 of the NHPA, an adverse effect is found when an undertaking (Proposed Action) may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance, or be cumulative. Following are examples of adverse effects:

- Physical destruction or damage
- Alteration inconsistent with the Secretary of the Interior's Standards for the Treatment of Historic Properties
- Relocation of the property
- Change in the character of the property's use or setting
- Introduction of incompatible visual, atmospheric, or audible elements
- Neglect and deterioration
- Transfer, lease, or sale out of federal control without adequate preservation restrictions

Under NEPA, federal agencies are required to consider the environmental impacts of their Proposed Actions and to incorporate reasonable alternatives to those actions. NEPA requires discussion of significant environmental impacts and reasonable alternatives that would avoid or minimize adverse impacts or enhance the quality of the human environment. NEPA recognizes direct, indirect, and cumulative effects. As defined by NEPA, direct effects are caused by the action and occur at the same time and place. Indirect effects are caused by the action but are later in time or farther removed in distance, yet are still reasonably foreseeable. Cumulative effects are the effects

on the environment that result from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions. NEPA recognizes both detrimental and beneficial effects.

One of the requirements of NEPA is to "preserve important historic, cultural, and natural aspects of our national heritage" (Sec. 101 [42 United States Code [U.S.C.] § 4331]). According to NEPA regulations, in considering whether an action may "significantly affect the quality of the human environment," an agency must consider the following, among other things:

- Unique characteristics of the geographic area such as proximity to historic or cultural resources (40 CFR 1508.27(b)(3))
- The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the NRHP (40 CFR 1508.27(b)(8))

5.2 National Register of Historic Places Status

5.2.1 Archaeological Resources

Three archaeological sites are located within the APE. CA-VEN-1072, the Burro Flats Painted Cave, was listed in the NRHP in 1976. Two previously identified sites, CA-VEN-1800 and CA-VEN-1803, are potentially eligible for listing in the NRHP. These properties are discussed in greater detail in Section 3.3.1. Table 7 lists each site and its NRHP status.

TABLE 7
Identified Archaeological Resources in the APE
Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Site Number	Property Name	NRHP/CRHR
56-001072/CA-VEN-1072	Burro Flats Painted Cave	Listed
56-001800/CA-VEN-1800	Rockshelter	Potentially Eligible
56-001803/CA-VEN-1803	Lithic scatter	Potentially Eligible

Notes:
CRHR = California Register of Historical Resources
NRHP = National Register of Historic Places

5.2.1.1 Site No. CA-VEN-1072 (Primary 56-001072)

The Burro Flats Painted Cave site was first recorded in 1959 (Rozaire, 1959). At that time, NRHP significance criteria had not been developed. The NRHP nomination form from 1975 does not indicate under which criterion the site is eligible. The NRHP website indicates that the site is significant for its informational potential, which would be Criterion D (NRHP, 2013). The Burro Flats Painted Cave was listed in the NRHP and the CRHR in May 1976. No change in status is recommended.

5.2.1.2 Site No. CA-VEN-1800 (Primary 56-001800)

This site was recommended eligible for the NRHP under Criterion D pending further study, because of its potential to yield information important to prehistory. The California SHPO reviewed this recommendation as part of a Section 110 consultation in February 2009 and commented that the sparse collection of artifacts and lack of features appeared to indicate that the site may have been used only rarely and could represent a single episode of use. Through communications in 2009, NASA and SHPO agreed the site would be considered potentially eligible for listing in the NRHP when an undertaking was identified and potential effects on historic properties were analyzed. Correspondence between NASA and SHPO regarding CA-VEN-1800 is included in the consultation record.

5.2.1.3 Site No. CA-VEN-1803 (Primary 56-001803)

This site is recommended eligible for the NRHP under Criterion D pending further study, because of its potential to yield information important to prehistory. This recommendation has not yet been reviewed by the California SHPO. For the purposes of this undertaking, this site is being treated as potentially eligible for listing in the NRHP.

5.2.2 Architectural Resources

The built environment survey conducted in January 2008 (ACI and WR, 2009), included a review and reconnaissance of the 139 federally owned buildings, structures, and sites within the APE, specifically within Area II of SSFL. ACI and WR identified one structure, a well, in Area I, but there is also a truck scale with a small operators shed in Area I, which are owned by Boeing (NASA 2013).

Three historic districts were recorded and evaluated for NRHP eligibility in August 2007 (ACI and WR, 2009). The historic districts are eligible for the NRHP under Criteria A and C. Within these historic districts, nine buildings are individually eligible for listing in the NRHP. The districts and structures have achieved exceptional importance within the past 50 years, and therefore, Criteria Consideration G applies. SHPO concurred on May 15, 2008, with the eligibility of the historic districts and their contributing elements, as well as with the individual eligibility of the nine structures. No change in status is recommended for the three districts. These properties are discussed in greater detail in Section 3.3.2. Table 8 lists the NRHP-eligible historic structures in the APE.

5.2.2.1 Alfa Test Area Historic District

The Alfa Test Area Historic District contains 10 contributing resources, 3 of which are also individually eligible for the NRHP. Constructed during 1954-1955, the district includes the test stands and control house, two observation structures, a terminal house, stand talker shack, electrical control stations, and elements of the natural and constructed landscape.

5.2.2.2 Bravo Test Area Historic District

The Bravo Test Area Historic District contains eight contributing resources, three of which are also individually eligible for the NRHP. Constructed during 1955-1956, the proposed district includes the test stands and control house, one observation structure, a terminal house, electrical control stations, and elements of the natural and constructed landscape.

5.2.2.3 Coca Test Area Historic District

The Coca Test Area Historic District contains 18 contributing resources, 3 of which are also individually eligible for the NRHP. Originally constructed during 1955-1956, some of the facilities were modified or redesigned between 1962 and 1964; additional facilities were designed between 1972 and 1978. The district includes the test stands and control center, three observation structures, a pre-test building, electrical control stations, compressor buildings, a pump house, a cable tunnel, and other auxiliary structures, as well as elements of the natural and constructed landscape.

TABLE 8
National Register of Historic Places Status of Historic Structures within the APE
Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

		NRHP Status	
Structure #	**Structure Name**	**Individually Eligible**	**Contributes to the District**
Alfa Test Area Historic District			
208	Alfa Control House	X	X
209	Alfa Terminal House		X
727	Alfa 1 Test Stand	X	X
727A	Alfa 1 Electrical Control Station		X
2729	Alfa 3 Test Stand	X	X
729A	Alfa 3 Electrical Control Station		X
739	Stand Talker Shack		X
2X	Alfa Observation Structure (Pill Box)		X
2Y	Alfa Observation Structure (Pill Box)		X
NA	Alfa Landscape/Spillway		X
Bravo Test Area Historic District			
213	Bravo Control House	X	X
214	Bravo Terminal House		X
730	Bravo 1 Test Stand	X	X
730A	Bravo 1 Electrical Control Station		X
731	Bravo 2 Test Stand	X	X
731A	Bravo 2 Electrical Control Station		X
2Z	Bravo Observation Structure (Pill Box)		X
NA	Bravo Landscape/Spillway		X
Coca Test Area Historic District			
218	Coca Control Center	X	X
222	Coca Pre-Test Building		X
235	Coca Electrical Control Station (LOX)		X
236	Coca Electrical Control Station (LH2)		X
237	Coca GH2 Compressor Building		X
239	Coca GH2 Compressor Building		X
241	Coca Pump House		X
520	Coca High Pressure GH2 and GN2 Vault		X
614	Coca 4 Observation Structure (Pill Box)		X
733	Coca 1 Test Stand	X	X
787	Coca 4 Test Stand	X	X
2A	Coca North Observation Structure (Pill Box)		X
2B	Coca Observation Structure (Pill Box)		X

TABLE 8
National Register of Historic Places Status of Historic Structures within the APE
Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

		NRHP Status	
Structure #	**Structure Name**	**Individually Eligible**	**Contributes to the District**
V99	Coca GH2 Vessel		X
V100	Coca LH2 Vessel #1		X
V108	Coca LOX Vessel #1		X
	Coca Cable Tunnel		X
NA	Coca Landscape/Spillway		X

Notes:
GH2 = gaseous hydrogen
GN2 = gaseous nitrogen
LH2 = liquid hydrogen
LOX = liquid oxygen
NRHP = National Register of Historic Places

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SECTION 6

Summary of Project Effects

6.1 Effects Finding from Proposed Action

NASA is proposing to demolish existing structures and to remediate contaminated soil and groundwater on the NASA-administered property at SSFL. The purpose of the Proposed Action is to remediate the environment to a level that meets NASA's environmental cleanup responsibilities and to undertake the demolition actions necessary to support both remediation and property disposition. The Proposed Action calls for remediation of contaminated soils to (Figure 8) to meet the 2010 AOC requirements, remediation to meet the 2007 Consent Order, and up to 100-percent demolition of structures. Because of the volume of soil removal required, including at the Burro Flats site (CA-VEN-1072), and the demolition of historic structures, the Proposed Action would result in an adverse effect to historic properties. The effects analysis and findings are discussed in detail in Section 4 of the EIS.

6.1.1 Archaeological Resources

Required soil remediation would result in soil removal from approximately 105 acres of the APE (Figure 8). Not all soil within the APE would be affected. Excavation into native soils associated with the environmental cleanup of NASA-administered LOX Plant Area I and Area II has some potential to result in adverse effects to buried archaeological resources. The areas possessing low to moderate sensitivity for buried deposits are within alluvial deposits, particularly Holocene-age sediments. Areas with a higher sensitivity for buried resources are near and within the boundaries of archaeological sites CA-VEN-1072, where known subsurface deposits have been documented in previous studies, and sites CA-VEN-1800 and CA-VEN-1803. The impact area footprint includes 0.65 acre of the NRHP-listed archaeological site CA-VEN-1072, indicating that soil would be removed from this site. This soil excavation and removal from the Burro Flats site would affect the significant archaeological site and result in a finding of adverse effect. Site CA-VEN-1800 is not within the footprint of soil or groundwater remediation areas and would not be affected by the Proposed Action.

Due to the quantity of soil proposed for removal under the Proposed Action, the possibility exists that previously undiscovered archaeological sites also could be affected, resulting in additional impacts on potential historic properties.

The footprint of the soil remediation areas, as depicted in Figure 2, currently shows a few cleanup areas outside the existing APE. When the remediation footprint is finalized, through consultation, the APE will be adjusted and these areas will be surveyed for cultural resources.

6.1.2 Potential for Undiscovered Archaeological Resources

In parts of the APE, the potential exists for archaeological resources to have been buried through alluviation, colluviation, or Aeolian processes, and such resources would not be found during the surface cultural resources reconnaissance surveys conducted to date. Generally, the potential of an area to contain buried resources can be assessed by distinguishing geological formations that can support buried cultural resources, normally within the Holocene age (10,000 years to the present), which is the geological age in which humans began occupation of the area. Geoarcheological investigations can better address the relationship between geological units and their potential to support buried cultural resources. This type of study analyzes the potential for any area to contain buried deposits based on topography, soil types, and proximity to water. Assessing the probability of an area to support buried archaeological deposits can be used to avoid high probability sites or to plan appropriate mitigation measures in the event that sites are discovered. On most of the NASA-administered property at SSFL, there is a low potential for buried archaeological resources due to lack of soils and the inability to support buried resources. However, geological deposits do exist in limited areas that could support subsurface cultural deposits; deposits of Holocene age soils are located in the known archaeological sites within the APE.

Archaeological excavations of CA-VEN-1072 have resulted in the documentation of subsurface deposits. This site is listed in the NRHP and has the potential to yield further significant data about the nature of human occupation of the area. Aside from the initial recordation, neither site CA-VEN-1800 nor site CA-VEN-1803 have been subject to further study and the depth of deposits is unknown. Important archaeological deposits with no surface expression may be buried beneath Holocene alluvial sediments.

Appropriate measures, such as preparing a plan for unanticipated discoveries, should be implemented to address the possibility of impacts on buried resources from the undertaking.

6.1.3 Architectural Resources

The Proposed Action calls for demolition of up to 100 percent of the structures on NASA-administered areas. It should be noted, that even if demolition is not necessary to meet cleanup goals, removal of a structure might occur as a result of other site planning or disposal requirements. Fifty-five buildings are proposed for demolition within the boundaries of the three historic districts, including the contributing elements of the districts and the nine individually eligible structures. The analysis of impacts from proposed demolition activities considers the removal of up to 100 percent of the structures on the NASA-administered property.

The demolition of contributing structures in the Alfa, Bravo, and Coca Test Area Historic Districts would result in adverse effects on each of these districts. Demolition of individually eligible or contributing structures also would have an adverse effect on historic properties. Demolition of noncontributing structures within the three districts would affect the setting and feeling of the districts due to the change in setting and visual character of the historic districts.

6.1.4 Sacred Sites

Although the boundaries of the Santa Ynez Band of Chumash Indians sacred site has not formally been established, this analysis assumes that all of the APE would be included in the sacred site designation. The ground-disturbing activities associated with demolition, soil remediation, and groundwater remediation would affect the sacred site. Through consultation, NASA and the tribe will determine appropriate measures to mitigate the effects on the sacred site. This consultation is confidential and ongoing.

6.1.5 Traditional Cultural Properties

Currently, it is unknown if there is a traditional cultural property partially or entirely within the APE. An assessment and evaluation are being conducted to determine whether there is a traditional cultural property in the area, and if there is, what the boundaries might be. The results of this evaluation will not be completed before the release of the draft EIS.

6.1.6 Cultural Flora and Fauna

Of the documented species inventoried on the NASA-administered property at SSFL during the biological investigations, as noted in Section 1.4, six plants and five animals were identified as having known cultural use by the Santa Ynez Band of Chumash Indians (Table 1). Section 3.4.4 of the EIS indicates that none of these plants or species is listed as rare, threatened or endangered, suggesting there is no danger of extinction of these plants and animals in the region. The Proposed Action would affect specific plants of this type in the areas of remediation, but would not threaten their existence or their cultural use by the tribe.

A Traditional Cultural Property and Cultural Landscape Assessment is being carried out to evaluate whether there are other flora and fauna that are significant to federal, state, and local tribes in the area and the potential impacts from removal of the species and plants from the APE as part of the Proposed Action.

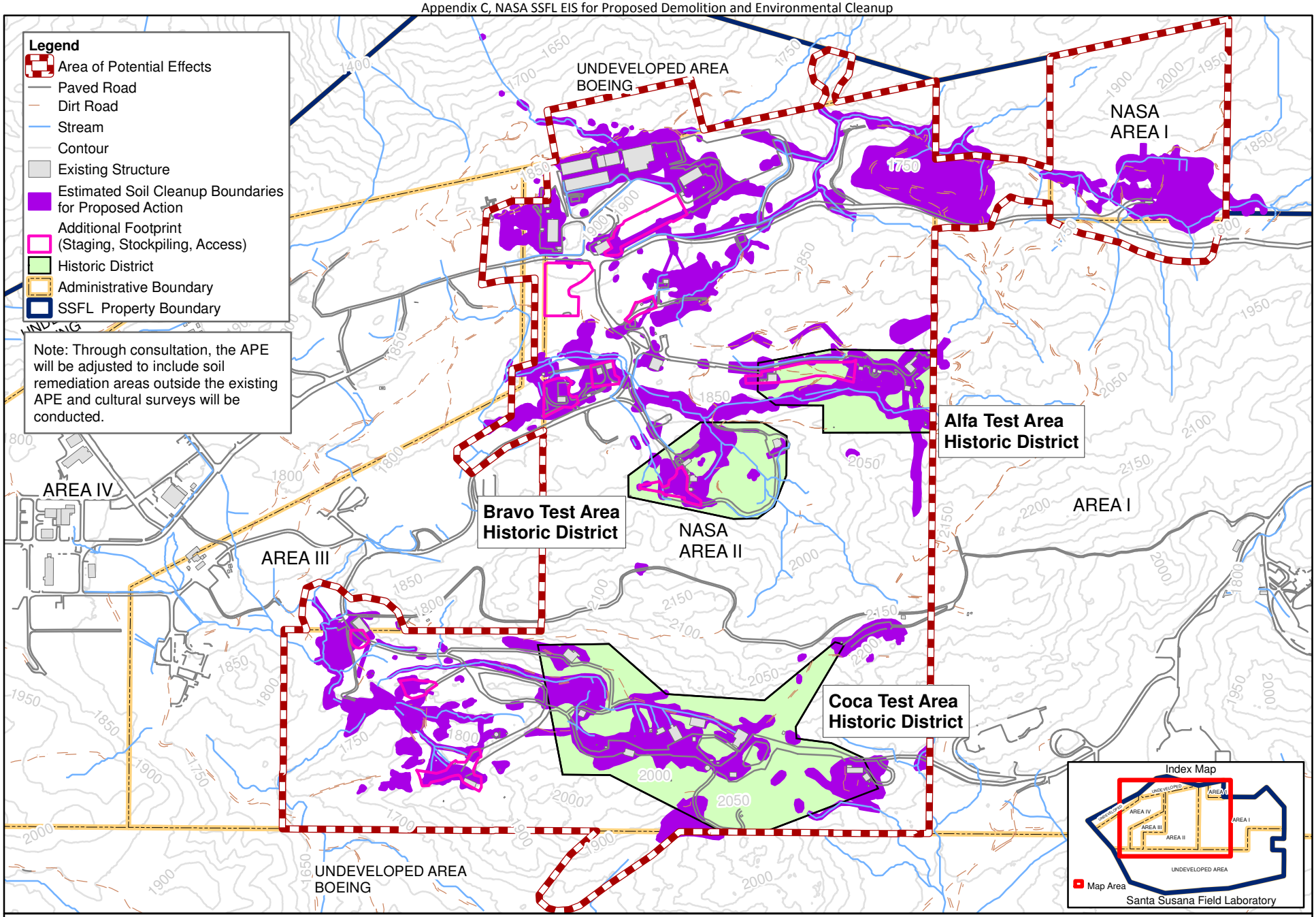

Figure 8
Proposed Soil Remediation Area Under the Proposed Action
NASA - Santa Susana Field Laboratory
Ventura County, California

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6.2 Resolution of Adverse Effect

Because the Proposed Action would result in an adverse effect to historic properties, a binding commitment to measures that avoid, minimize, or mitigate adverse effects on historic properties will be part of the Final EIS and ROD, in accordance with 36 CFR 800.8. Through the continuing consultation process, specific and appropriate measures to avoid, minimize, or mitigate adverse effects on historic properties will be determined. Consultation with SHPO, ACHP, Native Americans, and consulting parties is ongoing regarding the effect finding and the appropriate measures to mitigate the adverse effect.

The ROD will be used in lieu of a Memorandum of Agreement as the document formalizing the agreements among the parties in accordance with 36 CFR 800.8(c)(4)(i)(A). Using the NEPA process in lieu of Section 106 enables the submission of the draft EIS to SHPO, the ACHP, and other consulting parties to suffice for environmental documentation of historic properties.

6.3 Discovery of Human Remains

Human remains shall be treated with respect and dignity upon discovery. The County Coroner must be notified of the discovery of human remains within 48 hours; the State Health and Safety Code Section 7050.5 states that no further disturbance shall occur until the County Coroner has made a determination of origin and disposition pursuant to Public Resources Code Section 5097.98. If the remains are determined by the Coroner to be Native American, the Coroner is responsible for contacting the NAHC within 24 hours after the determination is made about the human remains. The NAHC, pursuant to Section 5097.98, immediately will notify those persons it believes to be most likely descended from the deceased Native American so they can inspect the burial site and make recommendations for treatment or disposal.

In addition, the NASA Federal Preservation Officer in the Environmental Management Division at NASA Headquarters must be contacted. After the Coroner has established whether the remains are archaeological or historical, NASA will follow the California state requirements. If the remains are prehistoric, NASA will initiate the proper procedures under the Archaeological Resources Protection Act of 1979 and/or the NAGPRA to decide the disposition of the materials. If the remains are found to be Native American, the steps outlined in NAGPRA, 43 CFR 10.6 (Inadvertent Discoveries), must be followed.

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SECTION 7

Conclusions

Historic properties within the APE include the Burro Flats Painted Cave (CA-VEN-1072); the Alfa, Bravo, and Coca Test Area Historic Districts; and nine individually eligible structures within the three districts. Sites CA-VEN-1800 and CA-VEN-1803 are being considered potentially eligible for the purposes of this undertaking. The NASA-administered areas of SSFL also have been declared an Indian Sacred Site by the Santa Ynez Band of Chumash Indians, in accordance with EO 13007.

NASA initiated NHPA Section 106 consultation with the SHPO and the ACHP in June 2011. The letter notified SHPO and ACHP of NASA's intent to use the NEPA process and documentation to comply with Section 106, in accordance with 36 CFR 800.8. The APE for this project was developed in consultation with the SHPO in 2011 and 2012.

NASA has found that the Proposed Action–demolition of existing structures, soil cleanup to background levels, and groundwater cleanup–would result in an adverse effect on historic properties, as detailed in the effects analysis and findings in the cultural resources subsection of Section 4 of the EIS.

Consultation with the SHPO, ACHP, Native Americans, and other consulting parties is ongoing. This consultation will culminate in measures to avoid, minimize, or mitigate adverse effects on historic properties. The ROD will stipulate the appropriate measures to resolve the adverse effect and formalize agreement among the parties.

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SECTION 8

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Appendix A
Representative Photographs

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Photo 1. Cultural Survey Overview, Northwest End in Area II

Photo 2. Survey Area Adjacent to Building 201

Photo 3. Overview of Survey Segment in Area II

Photo 4. Overview of Parking Lot in the Survey Area

Photo 5. Survey Area Within the Storable Propellant Area (SPA)

Photo 6. Overview of Disturbance in Survey Area

Photo 7. Overview of Area With Limited Visibility

Photo 8. Overview of Survey Area Within the Filtration Plant

Photo 9. Southern End of Survey Area (Area I) With Steep Terrain and Low Visibility

Photo 10. Overview of Survey Area South of Alfa Test Area

Photo 11. Overview of Survey Area and Disturbance

Photo 12. West of Coca Test Area, Concrete Drainage Running Parallel to the Road

Photo 13. Overview of Coca Test Area

Photo 14. Overview of Survey Area Adjacent to Service Road

Photo 15. Southern Survey Area, Overview From the Coca Test Area

Photo 16. Overview of Survey Area, Within the Coca Test Area

Photo 17. Overview of Coca Test Area

Photo 18. Test Stand in the Coca Test Area

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Appendix B
Consultation Record

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TABLE B-1

SUMMARY OF SECTION 106 CONSULTATION RECORD

Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Date	From	To	Subject	Summary
5/15/2008	SHPO	NASA	Historic Resources Survey and Assessment at SSFL	SHPO concurrence on the NRHP eligibility of Alfa, Bravo, and Coca historic districts.
2/2/2009	SHPO	NASA	Review of and comment on Cultural Resources Inventory	SHPO is unable to concur with the finding that site CA-VEN-1800 is eligible for listing in the NRHP. SHPO recommends treating the site as potentially eligible.
4/23/2009	NASA	SHPO	Cultural Resources Inventory eligibility	NASA responded to SHPO's letter regarding the eligibility of site CA-VEN-1800. NASA agrees with SHPO's recommendation to treat the site as potentially eligible.
6/8/2011	NASA	NAHC	Request for California Native American Contact List	Letter requesting a list of recognized tribes in the SSFL area. The cleanup of SSFL could impact the Burro Flats archaeological area. NASA would like to get input from interested tribes.
6/10/2011	NAHC	NASA	California Native American Contact List	NAHC responded to NASA's request and sent NASA a list of names and contact numbers for Native Americans in Los Angeles and Ventura counties.
6/30/2011	NASA	15 letters to persons on the Native American Contact List	Use of NEPA in lieu of Section 106 for SSFL demolition and cleanup of contaminated soil	NASA sent letters to the NAHC contact list notifying them of the undertaking, the EIS and NASA's intent to use NEPA in lieu of the Section 106 process. The letter included 6 maps: 3 overview graphics and the 3 maps of the historic districts.
6/30/2011	NASA	ACHP	Use of NEPA in lieu of Section 106 for SSFL demolition and cleanup of contaminated soil	NASA notified the ACHP of the undertaking and NASA's intent to use NEPA in lieu of the Section 106 process. Same attachments as 6/30/2011 letter to the NAHC contact list.
6/30/2011	NASA	SHPO	Use of NEPA in lieu of Section 106 for SSFL demolition and cleanup of contaminated soil	NASA notified the SHPO of the undertaking and NASA's intent to use NEPA in lieu of the Section 106 process. Same attachments as 6/30/2011 letter to the NAHC list.
7/27/2011	ACHP	NASA	Notice of participation	ACHP responded to NASA indicating they would participate in the SSFL Demolition and Cleanup Section 106 consultation process.

TABLE B-1

SUMMARY OF SECTION 106 CONSULTATION RECORD

Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Date	From	To	Subject	Summary
9/22/2011	NASA	SHPO, ACHP	Additional information on the undertaking.	NASA sent SHPO and ACHP two documents (Historical Summary of Structures and Summary of Soil Remediation) with more detailed information on the demolition and cleanup activities at SSFL.
9/22/2011	NASA	Romero, Santa Ynez Band of Chumash Indians	Additional information on the undertaking.	NASA sent Mr. Romero two documents (Historical Summary of Structures and Summary of Soil Remediation) with more detailed information on the demolition and cleanup activities at SSFL.
10/4/2011	NASA	Interested parties	Notification of Section 106 information on the NASA SSFL website	NASA sent an e-mail to the people and organizations who had participated in the scoping process and who had expressed interest in the 106 process at that time, notifying them that NASA had added information to their SSFL website about the Section 106 process.
11/22/2011	NASA	Santa Ynez Band of Chumash Indians	Request plants or animals that are significant to the tribe.	NASA asked the tribe if there were any plants or animals at SSFL the tribe considered significant for ceremonial reasons.
12/13/2011	Santa Ynez Band of Chumash Indians	NASA	List of flora and fauna.	The tribe sent NASA a list of flora and fauna and the cultural significance of each to the tribe.
2/10/2012	NASA	11 Consulting Parties	Invitation to consulting party meeting	E-mail notification of the first Section 106 consultation meeting to be held March 1, 2012.
3/1/2012	NASA	Consulting Parties	Consulting Party Meeting Presentation	Power Point presentation of the 3/1/2012 consulting party meeting. Wayne Fishback also gave a brief presentation and gave out materials to the attendees in person.
3/1/2012	NASA	Consulting Parties	Consulting Party Meeting Sign-In Sheets	Sign in sheet from the people on site and the sign in sheet for all attendees; on-site and on the phone
3/19/2012	NASA	NAHC	List of Native Americans	NASA sent an e-mail to NAHC requesting an updated list of Native Americans in Ventura and Los Angeles Counties.
3/19/2012	NASA	Consulting Parties	Consulting Party Meeting Sign-In Sheet and presentation	NASA contacted the participants of the 3/1/2012 consulting party meeting to send them the sign in sheet and presentation.

TABLE B-1

SUMMARY OF SECTION 106 CONSULTATION RECORD

Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Date	From	To	Subject	Summary
3/19/2012	Rowe	NASA	Comments on SSFL Section 106 process	Chris Rowe sent a letter discussing the significant cultural and archaeological sites at SSFL, as well as the significant buildings and structures and her wishes for their preservation and protection.
03/22/2012	Bowling	SHPO	Response to NASA's request for comments in writing	E-mail and attachment from Bill Bowling regarding potential impacts to historic properties at SSFL. The document is headed ACME Aerospace Contamination Museum of Education. The letter discussed possible extensive contamination of the buildings and their carcinogenic potential.
4/2/2012	NAHC	NASA	Response to request for Native American list	NAHC sent the updated list of Native Americans in Los Angeles and Ventura Counties.
4/16/2012	Harris	NASA	Section 106 Committee Input	Letter from Dr. Elizabeth Harris commenting on cost considerations of soil cleanup at SSFL and the differences between the cleanup options presented at the 3/1/2012 meeting. The letter comments on the presentation discussion of the removal of contaminated historic buildings.
5/21/2012	NASA	SHPO	SSFL cleanup APE	NASA sent SHPO the updated SSFL demolition and cleanup APE, based on SHPO's earlier comments, for their review and comment.
5/21/2012	NASA	ACHP	SSFL cleanup APE	NASA sent ACHP the SSFL demolition and cleanup APE for their review and comment.
5/22/2012	NASA	Santa Ynez Band of Chumash Indians	NASA SSFL APE for review	NASA sent the APE to identify the area that would potentially be affected by the SSFL demolition and cleanup. NASA requested receipt of the APE and comments on the APE from the tribe.
5/29/2012	NASA	21 Consulting Parties	NASA SSFL APE for review	NASA sent the consulting parties the updated APE for their review and comment. This letter and APE map were sent to the 21 consulting parties at that time.
6/15/2012	NASA	Santa Ynez Band of Chumash Indians	Section 106 consultation	This is a follow up letter to Vincent Armenta regarding Section 106 participation in the SSFL demolition and environmental cleanup project. NASA invited input from the tribe and again invited them to participate in the Section 106 process.

TABLE B-1

SUMMARY OF SECTION 106 CONSULTATION RECORD

Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Date	From	To	Subject	Summary
6/19/2012	SHPO	NASA	APE follow up questions	SHPO responded to NASA's 5/21/2012 submittal of the APE with two questions regarding archaeological sites and the status of tribal consultations.
7/21/2012	Santa Ynez Band of Chumash Indians	NASA	Informal request to be consulting party	Mr. Sam Cohen acknowledged receipt of an e-mail from NASA dated 5/25/2012. The tribe requested to be included in all Section 106 and other consultations regarding SSFL. He also said they would send a formal request at a later date.
7/23/2012	NASA	Santa Ynez Band of Chumash Indians	Acceptance of informal request for consultation	NASA responded to the tribe's informal e-mail requesting consultation. NASA accepted their request.
8/23/2012	NASA	24 Consulting Parties	SSFL Section 106 Consultation Meeting and Site Visit Summary	E-mail notification that the meeting summary from the March 1, 2012 meeting had been posted on the SSFL website. This record also includes the meeting summary.
8/23/2012	Walsh	NASA	Response to Section 106 Consultation Meeting and Site Visit Summary	Christina Walsh expressed concern that her views, which were stated at the meeting, were not represented in the meeting summary. She asked about how input will be considered and what can be done to save any structures.
8/24/2012	Larson	NASA	Response to NASA's e-mail regarding meeting notes.	Dan Larson sent an e-mail in response to the meeting summary announcement. He suggested all of SSFL should be a discontiguous site, including some of Bell Canyon. He discussed the significance of Burro Flats.
9/19/2012	Santa Ynez Band of Chumash Indians	NASA	Request for consultation	The tribe is requesting NHPA Section 106 consultation with NASA. The tribe requests their consultation not be open to the public.
9/24/2012	NASA	Consulting Parties	Notification of next consulting party meeting	NASA notified the 25 consulting parties of NASA's intent to meet by phone on 10/30/2012. NASA reiterated that comments on the undertaking should be submitted to NASA in writing and supplied several electronic and regular mail addresses.
10/1/2012	NASA	SHPO	SSFL final APE	NASA sent SHPO the APE with the survey areas and requested final comments on the SSFL demolition and cleanup APE.

TABLE B-1

SUMMARY OF SECTION 106 CONSULTATION RECORD

Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Date	From	To	Subject	Summary
10/2/2012	Luker	NASA	Letter to Olga Dominguez with attachments from other groups.	The SSMPA disagrees with NASA's decision to have a limited scope in the upcoming EIS. Attached to the letter were statements from SSMPA and Chatsworth Neighborhood Council and two previous letters to the DTSC.
10/17/2012	Bowling	NASA	Section 106 comments	Mr. Bowling is asking about the 10/30/2012 consulting party meeting and commenting on the 03/01/2012 meeting. The attached comments were from ACME. The structures at SSFL sit on cancerous solvents and are covered with lead paint. The only way to discover the extent of the contamination is removal of the buildings.
10/18/2012	NASA	Consulting Parties	Announcement of 10/30/2012 consulting party meeting	NASA e-mailed the consulting parties to announce the 10/30/2012 consultation meeting via teleconference. Based on an earlier request, the names of the consulting parties were attached to the e-mail.
11/01/2012	Weitzberg	NASA	Comments from the 10/30/2012 consulting party meeting	Supportive of the NEPA in lieu of Section 106 process. Emphasizes the need to minimize impacts and adverse effects on historic properties. Concerned that the AOC is not conducive to preservation of cultural resources.
11/18/2012	Bollinger	NASA	Comments from the 10/30/2012 consulting party meeting	Comments discuss an overview of SSFL, Native American cultural assets, and rocket engine test stands. Need evaluation studies to determine which test stands are feasible to preserve. A combined cultural and rocket space museum including Native American culture would be beneficial.
11/19/2012	NASA	Consulting Parties	Summary of Issues Raised at the consulting party meeting	E-mail with the meeting summary attached. Listed attendees at the 10/30/2012 meeting. Included a bullet list of issues discussed at the meeting. Requests written comments by 12/1/2012.

TABLE B-1

SUMMARY OF SECTION 106 CONSULTATION RECORD

Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Date	From	To	Subject	Summary
12/03/2012	NPS	NASA	Comments on the environmental cleanup and demolition at SSFL	Support efforts to protect known and unknown Native American archaeological sites. Suggests an open dialogue that examines a full range of cleanup strategies. Recommends the EIS explore options for preserving the text stands for education and interpretation. Preservation of historic resources should be an alternative in the EIS. The EIS should include costs of stabilizing and maintaining the test stands. NPS special resource study for the Rim of the Valley Corridor is under way. SSFL is within the study area.
12/03/2012	SHPO	NASA	Demolition and Cleanup Activities at SSFL	Written statement of concerns regarding the undertaking. The EIS should include a clear Purpose and Need statement, and explanations of the Proposed Actions, including excess property declaration. NASA should consider the possibility of an archaeological district. Urges NASA to reinstate consideration of alternatives that don't result in 100% demolition of structures. A full range of alternatives would allow consulting parties to comment on a range of options.
12/06/2012	Rowe	NASA	SSFL Section 106 consultation comments	Very important to keep the archaeological sites protected and that Native American monitors be used during the sampling and remediation phases. Known archaeology sites should be excluded from AOC remediation requirements. Support the use of local archaeologists. SSFL should be considered in its historic context as a whole, not just NASA areas. Supports cleaning up to Residential standards.
12/14/2012	Bowling	NASA	SSFL Section 106 consultation comments	Need to make sure the watershed is cleaned up as it is a tributary of the Los Angeles River. Wants to ensure proper cleanup of SSFL. A decision on demolition or preservation cannot be made until the extent of contamination is known.
01/02/2013	Tejada	NASA	SSFL Section 106 consultation comments	Disappointed that NASA only considering alternatives consistent with AOC. Archaeological monitoring should be included in early soil testing activities and throughout the process. Produce an ethnographic study of the area; Burro Flats may be a TCP. Would like to preserve at least one test stand. Proponent of SSFL becoming parkland within the Rim of the Valley Corridor.

TABLE B-1

SUMMARY OF SECTION 106 CONSULTATION RECORD

Cultural Resources Study for Environmental Cleanup and Demolition at SSFL, NASA Areas I and II

Date	From	To	Subject	Summary
01/31/2013	NASA	Consulting Parties	October 2012 meeting notes	Announcement that the finalized meeting notes were posted on the SSFL website and the link to the site.
02/28/2013	NASA	Consulting Parties	Notice of Consulting Party Meeting on 3/15/2013	Announcement of the next consulting party meeting to be held at SSFL on 3/15/2013. The main topic will be the proposed Traditional Cultural Property study, to be conducted based on previous consulting party input.
03/05/2013	NASA	Consulting Parties	Agenda for Consulting Party Meeting on 3/15/2013	Attached the agenda for the consulting party meeting on 3/14/2013, including the call-in number and conference call code.
03/13/2013	NASA	Consulting Parties	Brochure for Consulting Party Meeting on 3/15/2013	Attached a brochure on Traditional Cultural Properties to be discussed at consulting party meeting on 3/15/2013.
03/15/2013	NASA	Consulting Parties	Meeting materials for Consulting Party Meeting on 3/15/2013	Includes agenda, NASA TCP brochure, Wayne Fishback Presentation, and Christina Walsh presentation.
03/15/2013	NASA	Consulting Parties	List of attendees from 3/15/2013 Consulting Party Meeting	List of individuals who attended the consulting party meeting in person at SSFL and via teleconference.

Notes:
ACHP = Advisory Council on Historic Preservation
AOC = Administrative Order on Consent
APE = Area of Potential Effects
EIS = Environmental Impact Statement
NAHC = Native American Heritage Commission
NASA = National Aeronautics and Space Administration
NEPA = National Environmental Policy Act
NPS = National Park Service
SHPO = State Historic Preservation Officer
SSFL = Santa Susana Field Laboratory
SSMPA = Santa Susana Mountain Park Association
TCP = Traditional Cultural Property
Consultation record through April 4, 2013. Consultations are ongoing.

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Appendix C
Project Personnel Qualifications

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Gloriella Cardenas, M.A., RPA

Cultural Resources Specialist
CH2M HILL Santa Ana, California

Education

M.A., Anthropology, California State University, Fullerton, 2005
B.A., Anthropology, California State University, Los Angeles, 1999

Professional Registrations

Register of Professional Archaeologists (2005, No. 15777)
Riverside County Cultural Register (2007, No. 158)

Distinguishing Qualifications

Meets Secretary of Interior Professional Qualification Standards (36CFR61)
California BLM Cultural Use Permit (*CA-10-31*)

Relevant Experience

Ms. Cardenas has participated in California archaeology since 1998. She completed her Masters degree in Anthropology at California State University, Fullerton with an archaeological thesis dealing with Southern California prehistoric architecture and the use of household space. Ms. Cardenas has 7 years of experience in cultural resource management, Phase I, II and III investigations, supervision and directing field crew, laboratory processes, curation, artifact analysis, research, and report writing. Projects have been conducted throughout the American Southwest and have involved renewable energies, gas and electric, private developers and military installations in cooperation with agencies such as BLM, California Energy Commission, US Army Corps of Engineers, Native American Tribes, SHPO, and the U.S. Department of Defence. Archaeological investigations for renewable energies have focused in Florida, Georgia, Oklahoma, Texas, New Mexico, Nevada, Arizona, Colorado, and California. Investigations have been conducted in support of state and federal legislature such as Section 106 and 110 of the NHPA, CEQA, and NEPA. Ms. Cardenas meets the Secretary of the Interior's Standards for Qualifications for Archaeologists.

Professional Positions Held

Cultural Resources Specialist, 2008- Present
Project Archaeologist, 2006-2008
Crew Chief, 2005-2006
Research Assistant, 2004-2005

Project Experience

AES-Southland System Repowering Application for Certification. Cultural Lead for three projects, Huntington Beach Generating Station, Redondo Beach Generating Station and Alamitos Generating Station. Lead was responsible for archaeological assessment, pedestrian survey, and report of findings in support of CEQA, PRC Chapter 2.6, Section 21083.2 and 21084.1, and the California Code of Regulations (CCR) Title 14, Chapter 3, Article 5, Section 15064.5, and author for cultural documents for the Application for Certification with the California Energy Commission,.

National Aeronautics and Space Administration (NASA), Santa Susana Field Laboratory, Areas I and II, Ventura County, California. Cultural Lead responsible for survey, assessments, the Cultural Section of

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the Environmental Impact Statement in support of NEPA, and the Archaeological Resource Management Report.

Federal Emergency Management Agency for the City of Moreno Valley, San Timoteo Foothill Neighborhood Flood Protection Project. Cultural Lead of an archaeological investigation and consultation in support of Section 106.

Cal Energy Black Rock 5 and 6 Geothermal Project, Imperial County, California. Cultural Resources Lead responsible for archaeological assessment, pedestrian survey, cultural documents and report of findings in support of CEQA, PRC Chapter 2.6, Section 21083.2 and 21084.1, and the California Code of Regulations (CCR) Title 14, Chapter 3, Article 5, Section 15064.5, and the Application for Certification with the California Energy Commission.

Los Angeles World Airports, Los Angeles International Airport, California. Cultural Resources Lead responsible for the monitoring activities and personnel for the modernization activities of Taxilane S and Bradley West projects. Author of technical report.

First Wind, LLC, Painted Hills IV Project, Riverside County, California. Field Director responsible for a cultural resources survey of 400 acres in support of CEQA and the County of Riverside's General Plan, for a proposed wind turbine facility on private land. Responsibilities included being permitted with the County of Riverside, leading the intense pedestrian survey, data management and authoring the technical report.

Solar Reserve, LLC, Rice Solar Energy Project, Riverside County, California. Cultural Resources Specialist and primary author for the Cultural Resources Monitoring and Mitigation Plan.

TerraGen Power, LLC, Alta Infill II Wind Energy Project, Kern County, California. Field Director responsible for a Class III cultural resources survey of 810 acres for a proposed wind turbine facility and testing and evaluation of a prehistoric lithic site. Responsibilities included producing a cultural survey report and testing report. Work was conducted in April and June of 2011.

TerraGen Power, LLC, Morgan Hills Wind Energy Project, Kern County, California. Field Director responsible for a Class III cultural resources survey of 1,200 acres. This cultural resources inventory was conducted in compliance with the California Environmental Quality Act (CEQA) as part of an application to Kern County for a Conditional Use permit to construct and operate the Morgan Hills project. Work was done in April and May of 2011.

Contra Costa County Generating Station, LLC, Oakley Generating Station Project, Contra Costa County, California. Cultural Resources Specialist, Alternate and co-authored the Cultural Resources Monitoring and Mitigation Plan submitted to the California Energy Commission. Work was done in January 2011.

TerraGen Power, LLC, Loma Verde Solar Energy Park, Riverside County, California. Field Director responsible for a Class III cultural resources survey of 1,000 acres for a proposed PV solar energy generation field. Property was comprised of both private and public lands, the latter is administered by the BLM. Work was conducted in December 2010.

NextEra Energy Resources, LLC, North Sky River Wind Project, Kern County, California. Cultural Resources Specialist involved in a Class III cultural resources survey on public lands administered by the BLM under Use Permit No. CA-10-31. Responsibilities for this project included, analysis of previous studies, systematic pedestrian survey , documentation of new discoveries, data management, and contributions to the technical report. Work was conducted between October and November 2010.

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Mariposa Energy Project, Alameda County, California. Ms. Cardenas was the Cultural Resources Specialist, Alternate and co-authored the Cultural Resources Monitoring and Mitigation Plan submitted to the California Energy Commission. Work was done in January 2011.

New River Siphon Project for the All American Canal, Calexico, California. Ms Cardenas conducted a cultural resources archival literature search for historic and archaeological resources with the CHRIS center. Work entailed an analysis of findings, evaluation of a bridge for the NRHP listing and a "critical issues" report. Work was done in January 2011.

Turlock Irrigation District, Almond 2 Power Plant, Stanislaus County, California. Ms. Cardenas was the Cultural Resources Specialist, Alternate and co-authored the Cultural Resources Monitoring and Mitigation Plan submitted to the California Energy Commission. Work was done in January 2011.

Cedar Point Windfarm, Lincoln and Washington Counties, Colorado. A literature search was conducted with the Colorado Historical Society Office of Archaeology and Historic Preservation and the report of findings was written in December 2010.

SNG Suwannee Pipeline Project, Alabama, Georgia and Florida. Ms Cardenas conducted a cultural resources archival literature search for historic and archaeological resources with the cultural resources repositories in each state. Work entailed an analysis of findings and a "critical issues" report. Work was done in November 2010.

Ivanpah Solar Generating Station, San Bernardino County, CA. Ms. Cardenas participated in additional field studies of several locations around the Ivanpah SEGS project area, including pedestrian survey and site recordation in September 2008 and was the Alternate Cultural Resources Specialist and co-author for the Cultural Resources Monitoring and Mitigation Plan submitted to the California Energy Commission and BLM in November 2010.

Southern California Edison (SCE), Tehachapi Renewable Transmission Project (TRTP) – Segments 4-11 Compliance Monitoring. Environmental Scientist involved in photo documentation of transmission line to support post construction restoration. The TRTP includes construction of new and upgrade of 173 miles of transmission lines, construction of one new substation, major upgrade of one existing substation and upgrade of other ancillary facilities. Work was done from July to October 2010.

Southern California Edison (SCE), Devers Palo Verde No. 2 Transmission Line Project. Environmental Scientist involved in environmental compliance support and development in mitigation plans in support of CPUC requirement. Ms. Cardenas's role on this project involved authoring plans to address CPUC traffic, construction specifications, and cultural resources in response to regulatory requirements, as well as contributions in research for biological restoration, Storm Water Pollution Prevention Plans, construction scheduling and agencies' responsibilities. Work was done from April to July 2010

Phase II Cultural Resources Evaluation of 30 Sites at Edwards, Air Force Base, California. FY09 and FY10 2009-L. Ms Cardenas was Principal Archaeologist and Director of Field and Laboratory, responsible for research design and evaluation of 30 sites consisting of historic refuse deposits, homesteads, and prehistoric camp and lithic deposits, in the Western Mojave Desert. Other project duties included setting up the laboratory facilities, creating project specific documentation forms, the implementation of procedures and training of 6 technicians in lab as well as field methods, site updates (DPR forms) for 30 sites, and report writing. The project was conducted in support of Section 106 and 110 of the National Historic Preservation Act of 1966, as amended, and Air Force Instruction 32-7065, Cultural Resource Management. JT3/CH2M HILL conducted the evaluation under Letter of Technical Direction

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1B0220000-0001, Environmental Management Support, as part of contract F042650-01-C-7218, under the command of the Base Historic Preservation Office.

2009-K-PLT42 Phase II Cultural Resources Evaluation of Site EAFB-3897, Air Force Plant 42, Los Angeles County, California. FY09. Project and Field Director for the test excavation and evaluation of a Gypsum Period temporary camp site. Responsibilities included, but were not limited to, coordination with Air Force Plant 42 security personnel, training of field technicians, creation and implementation of procedures for project design and methods, and writing the final report of findings. The project was conducted in support of Section 106 and 110 of the National Historic Preservation Act of 1966, as amended, and Air Force Instruction 32-7065, Cultural Resource Management. JT3/CH2M HILL conducted the evaluation under Letter of Technical Direction 1B0220000-0001, Environmental Management Support, as part of contract F042650-01-C-7218.

Archaeological Inventory FY09 2009-D, Edwards AFB, California. Archaeologist involved in Phase I investigation of 2500 Acres on EAFB, in support of the continued base-wide inventory. Work was conducted in accordance with the Integrated Cultural Resources Management Plan, under the command of the Base Historic Preservation Office.

2009-C Protection of Historic Properties, Edwards AFB, California. Archaeologist involved in support of site preservation to assist the Air Force in complying with the provisions of the National Historic Preservation Act, as amended; the Archaeological Resource Protection Act; Native American Graves Protection and Repatriation Act; American Indian Religious Freedom Act; and Air Force Instruction 32-7065, Cultural Resource Management. Work was conducted for the Site Preservation Program for Fiscal Year 2009, as specified in Letter of Technical Direction 1B022000-0001-R2, Environmental Management Support, as part of Contract F42650-01-C-7218.

Old Ridge Route Project, in the Angeles National Forest, California. Client Federal High Way Administration. July 2008 to September 2008. Archaeologist involved in the monitoring of the emergency repair of Federally Owned Roads upon the NHPA listed Old Ridge Route, 8N04.

Modesto Irrigation District, 49 MW Power Plant Project, Modesto, California. Client: Modesto Irrigation District. August 2008. Archaeologist responsible for a Phase I pedestrian survey for a 49-megawatt power plant, a cultural inventory search, and contributions to the report.

Iberdrola Renewables Biological and Cultural Assessment Support Project. Client: Iberdrola Renewables. Ms. Cardenas was responsible for conducting cultural inventories, fatal flaw reports, and field reconnaissance studies. Ten sites were evaluated for solar power plants for possible acquisitions in California, Nevada, Arizona and New Mexico. Five study areas of this overall project are located in Arizona; two are in Maricopa County, two are in La Paz County, and one project is located partially in La Paz and Yuma Counties. Project acreages range from 5,800 acres to 35,000 acres. Three of these study areas are located in California; two areas are in San Bernardino County and one is located in Imperial County. Project acreages range from 13,000 to 29,000. Three of these study areas are located in Nevada; two are in Nye County and one is located in Clark County. Project acreages range from 7,500 to 12,000. The remaining study area is located in Hidalgo County, New Mexico. Total acreage of this project is 25,000. Work was conducted in July through September of 2008.

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Experience Prior to CH2M HILL

Chocolate Mountains Aerial Gunnery Range, Seal Weapons and Tactics Areas 4 and 5, Imperial and Riverside Counties, California. Client: U.S. Navy, San Diego, CA. January 2008 to April 2008. Archaeologist during a Phase I pedestrian survey of 2 areas encompassing 2,200 acres within the Naval Special Warfare Desert Training Facility. Duties included recordation of transects, GPS, field notes and documentation of discoveries, photography, DPR forms, and report writing in accordance to Section 106 guidelines.

Noble Windpark Project, Great Plains, Texas. Client: Noble Environmental Power. Archaeologist during a Phase I survey of a transmission right-of-way the length of which was approximately 8 miles. Other duties included report writing in accordance with the National Historic Preservation Act, Section 106 guidelines.

Noble Mitchell County Wind Farm, Mitchell, Coke, and Sterling Counties, Texas. Client: Noble Environmental Power. Researcher responsible for conducting a cultural inventory search with the Texas Historical Commission and the National Register of Historic Places. Duties also included producing the report of findings.

Mid County Parkway, Riverside County, CA. Client: Caltrans District 8. November 16, 2007 to January 4, 2008. Archaeologist and Field Supervisor for a Phase II investigation of 9 Prehistoric sites CA-RIV-1512, 1650, 6989, and 8712, as well as 33-16678, 33-16679, 33-16680, 33-16685, and 33-16687. The nine sites investigated were comprised of milling stations in granite outcrops with surface artifacts, quarries, habitation, and multi-used sites. Evaluations are pending for potential of eligibility for the National Register of Historic Places and the California Register of Historical Resources. Responsibilities changed with the needs of the project and were site specific, but everyday duties included crew management, field direction, data management, documentation, collection and transportation of artifacts, analysis, evaluation of site boundaries and placement of STPs, surface collection grids, test units, surface scrape units, and the write-up of weekly reports, analysis and the report write up for ground stone artifacts.

Planning Area 6, Neighborhood 4A, Phase 2 Residential, Irvine, CA. Client: The Irvine Community Development Company (ICDC). January 1, 2007 – November 16, 2007. Project Archaeologist responsible for archaeological discoveries found during rough grade activities. Duties included, but were not limited to hiring technicians, coordination, site inspections, scheduling, managing documentation and finds, GIS, field direction in securing finds/sites, testing, excavation, collection, laboratory processing and curation of artifacts, weekly discoveries report to Army Corps Of Engineers, and technical report writing. Data recovery sites were CA-Ora-244, locus G with twenty three 2-by-2 meter units and PA6-15 with six 2-by-2 meter units. All units at site 15 contained thermal features.

Planning Area 40, Irvine, CA. Client: The Irvine Community Development Company (ICDC). May 2007. Project archaeologist for on call services for site inspection, resource impact analysis and field monitoring. A complete record search at a CHRIS information center was conducted using the following resources: Historical USGS and other historical maps, National Register of Historic Places, California Register of Historical Resources, California Inventory of Historical Resources, California State Historical landmarks, Directory of Properties in the Historical Resources Inventory, and quad maps showing survey footprints, sites, and isolates.

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The Irvine Company, Portola Springs (Planning Area 6 Phase II) Data Recovery Irvine, CA. Client: The Irvine Community Development Company (ICDC). December 2005 to June 2007. Project Archaeologist responsible for the supervision of 6 lab technicians, training new personnel in artifact analysis, database quality control, ground stone analysis and its corresponding chapter for the report, data management, photo archiving, further contributions to the technical report included field, wet screen and analysis methods, and an appendix for the site records which were submitted to the CHRIS information center.

The Irvine Company, Portola Springs (Planning Area 6 Phase II) Data Recovery, Irvine, CA. Client: The Irvine Community Development Company (ICDC). November 2005 to December 2006. Senior Crew Chief responsible for a 13-month-long Phase III investigation. Field responsibilities included, but were not limited to: keeping detailed data logs, photography, site documentation, equipment, directing a 20 person crew which included 2 assistant crew chiefs, scheduling, macrobotanical sampling and floatation, pollen sampling, wet screen station, artifact collections, transporting archaeological materials, maintenance of field supplies, purchasing, and general coordination. Sites investigated were: CA-Ora-244, 650, 762, 1297, 1311, 1588, and 1590 with a combined total of four hundred and forty three 2- by 2-meter units.

The Irvine Company, Portola Springs, Center Village and Lomas Valley Phase II Irvine, CA. Client: The Irvine Community Development Company (ICDC). January 2005 to September 2005. Crew Chief responsible for Phase II and III investigations, field supervisions, productivity logs, photography, site documentation, equipment, macrobotanical sampling and floating, wet screen station, artifact collections, pollen sampling, transporting archaeological materials, maintenance of field supplies, purchasing, and general coordination. Duties extended to the laboratory post excavation where responsibilities included supervising and training technicians, analysis, quality assessment, cataloging, DPR forms, scheduling maintenance of equipment, and archiving all archaeological data. All sites were tested to assess their significance per CEQA (California Environmental Quality Act) Guidelines and CRHR (California Register of Historical Resources). Sites investigated were PA6-01, 02, 03, 05, 06, 07, 08, 09, and 10.

Marblehead Coastal Development, in San Clemente, CA. Client: SunCal Company. January 2005 to April 2005. Paleontological and cultural monitor during rough grading activities, mapping, photography, GPS, scheduled and supervised other cultural and paleontological monitors

Pelican Hill in Newport Beach, CA. Client: The Irvine Company. September 2005 to November 2005. Field supervisor for rough grade activities. Duties included coordination with contractors, scheduling of paleontological and cultural monitors, and site inspections and assessment of discoveries.

The Irvine Company, Portola Springs, Center Village and Lomas Valley Phase I- Irvine, CA. Client: The Irvine Community Development Company (ICDC). June 2004 to September 2005. Crew chief responsible for providing cultural resource monitoring and evaluation services for a large scale development involving many previously recorded archaeological sites. All sites were tested to assess their significance per CEQA (California Environmental Quality Act) Guidelines and CRHR (California Register of Historical Resources). During Phase II and III investigations, field responsibilities included technician training and supervision, running field excavations and wet screen stations, macrobotanical sampling and floating, as well as lab analysis and management. Ground stone and lithic artifacts were analyzed for use and prepared for residue analysis

Gloriella Cardenas, M.A., RPA

County Sanitation Districts of Los Angeles County, Lancaster Water Reclamation Plant Expansion Project. Client: Los Angeles County Sanitation Districts Nos. 14 and 20. August 2005. Crew chief for Phase I and II investigations, responsible for all pre-field preparations and equipment maintenance. Phase II was conducted on three sites discovered during the Phase I pedestrian survey. Temporary sites name are LWR-01, 02, and 03. Excavation responsibilities included site documentation and mapping, surface collection, photography, transporting of data, materials and crew, supervision of field technicians, and collecting specimens for sampling. Laboratory responsibilities included technician supervision, residue analysis preparations, lithic and ground stone analysis, and macrobotanical sampling and floatation.

El Dorado County Department of Transportation, California Tahoe Conservancy, Lake Tahoe Blvd Lane Reduction & Bike Trial Project, South Lake Tahoe, CA. Client: El Dorado County Department of Transportation. July 2005. Researcher responsible for archaeological documentation and organization. Researched historic and prehistoric archaeological sites including prehistoric camps and bedrock mortar sites, and conducted record searches for the cultural inventory in the project area. A write up of the literature search was produced and submitted in the final report.

Planning area 18 in Irvine, California. Client: The Irvine Community Development Company. September 2005. Crew chief responsible for conducting ten sixty meter trench excavations for Phase II testing. Conducted ground stone and lithic analysis of materials recovered during trenching as well as from previous pedestrian surveys.

Watkins House Historical Evaluation, University of California, Riverside. Client: UC, Riverside. July 2005. Research assistant to the historical archaeologist and was responsible for recording existing room dimensions, including storage rooms, vestibules, offices, chapel, halls, and furnishings. Also recorded were the modern modifications, room elements, and original components of the Watkins house. Responsibilities included photo documentation, and historical research. Contributions were included in the final report.

Shady Canyon Development Project, Irvine, CA. Client: The Irvine Community Development Company. September 2004 to December 2004. Lab technician responsible for floating macrobotanical samples, data entry, archiving and accessioning archaeological collection from sites CA-ORA-383, 730, 732, 733, 806, 1420b, 1422, 1423, 1576, 1582, 1584, 1585, 1586, and 1587

CA-ORA-1589, Irvine, California. Client: The Irvine Community Development Company (ICDC). July 2004 to August 2004. Crew member in a Phase III data recovery of a prehistoric site consisting of thirteen two by two meter units, excavated each in quad units. Responsibilities included producing detailed level forms, soil samples, wall profiling, floating macrobotanical samples, running the wet screen station, data entry, artifact analysis in lab as well as preparing documents and other materials from the project into archival formats.

Espana, CA-RIV-7458, Indio, CA. Client: Regency Homes. August 2004. Crew member of a Phase II investigation of a prehistoric Cahuilla site. Site was surveyed and surface materials were documented prior to beginning excavation. Responsible for training field technicians in excavation, documentation, extracting soil samples, and producing wall profiles, as well as excavating three one by three meter units.

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Professional Organizations/Affiliations

Society for American Archaeology
Society for California Archaeology

Professional Development

CEQA Workshop November 2007
Section 106 Essentials Workshop September 2011

Languages

English and Spanish

Presentations

California State University, Fullerton 23th Annual Anthropology Symposium 2003: A Chronological Synthesis of Southern California

SAA 2007 Conference: Site Structure and Function of Hunter Gatherer Communities of the Tomato Springs Region: A Look at Ground Stone Artifacts

Employment History

Archaeologist May 2008 to June 2008
Applied Biology
Duties: Archaeologist responsible for conducting 7 intense pedestrian surveys in Riverside County, California for transmission lines and telecommunications projects.

Archaeologist January 2008 to April 2008
Ecology and Environment, Inc.
Duties: archaeologists filling various capacities in Phase I investigations as well as conducting record searches, writing fatal flaw reports, and technical reports in accordance with National Historic Preservation Act, Section 106 guidelines.

Archaeologist November 2007 to January 2008
LSA Associates, Inc.
Duties: Field supervisor for projects in compliance with CEQA, 36 Code of Federal Regulations and Section 106 guidelines. Responsibilities included but were not limited to, supervision and directing of crew, artifact collection, creating and managing documentation, GPS, artifact analysis, scheduling, and report writing.

Archaeologist, July 2004 to November 2007
Stantec Consulting, Inc. Irvine, California
*Project Archaeologist, December 2006 to November 2007

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Director of archaeological investigations that included, but were not limited to, survey, construction monitoring, testing of two prehistoric sites and data recovery of 9 Historic Properties under the jurisdiction of the Unites States Army Corps of Engineers. Responsibilities included conducting cultural inventory searches, producing research designs, artifact analysis, GIS, coordination with Native American consultants and development contractors, scheduling staff, managing documentation (digital and hardcopy), producing 23 DPR site records updates, and report writing in accordance with CEQA and ARMR guidelines.

*Senior Crew Chief, June 2005 to December 2006
Stantec Consulting, Inc. Irvine, California (Formerly The Keith Companies)
Field Supervisor for monitoring, survey, test excavations, and data recovery of Historic Properties under the jurisdiction of the Unites States Army Corps of Engineers. Ms. Cardenas was also responsible for the supervision of lab technicians, artifact analysis, coordinating with development contractors and staff, archiving documentation, GPS, photo documentation, DPR forms, site updates, research, and assisting in report writing.

*Junior Crew Chief and Research Assistant, July 2004 to June 2005
The Keith Companies Irvine, California
Responsibilities included supervising field crews for Phase II test excavations and data recovery, assisting in report writing, digitizing documentation, data entry, cataloging, photography, artifact analysis, curation, paleontological monitoring and coordination, mapping, site forms and record updates.

Selected Reports

2011 *Cultural Resources Inventory Report for the Santa Susana Field Laboratory, Areas I and II, Ventura County, California.* Prepared for the National Aeronautics and Space Administration, George C. Marshall Space Flight Center, Alabama.

2011 *City of Moreno Valley San Timoteo Foothill Neighborhood Flood Protection HMGP-DR-1810-CA: Finding of No Historic Properties Affected.* Prepared for the City of Moreno Valley, California and Federal Emergency Management Agency.

2011 *Cultural Resources Inventory Report for the Black Rock 5 & 6 Geothermal Project, Imperial County, California.* Prepared for CalEnergy, LLC and the California Energy Commission, Sacramento, California.

2011 *Application for Certification of the Black Rock 5 & 6 Geothermal Project: Section 5.3 Cultural Resources.* Submitted to the California Energy Commission, Sacramento, California.

2011 *Cultural Resources Monitoring Report for Taxilane S and Bradley West, Los Angeles World Airports, Los Angeles County, California.*

2011 *Draft Cultural Resources Inventory Report for the Painted Hills IV Wind Energy Project, Riverside County, California.* Prepared for First Wind Energy, LLC, by CH2M HILL, Santa Ana, California.

2011 *DRAFT Cultural Resources Monitoring and Mitigation Plan, Rice Solar Energy Project.* Prepared by Gloriella Cardenas and Aaron Fergusson for the U.S. Bureau of Land Management and the California Energy Commission on behalf of Solar Reserve, LLC.

Gloriella Cardenas, M.A., RPA

2011 *Cultural Testing Report for the Alta Infill II Wind Energy Project, Kern County, California: For Archaeological Temporary Site No. S-11.* Submitted to the Kern County Planning Department, Kern County, California.

2011 *Cultural Resources Inventory Report for the Alta Infill II Wind Energy Project, Kern County, California.* Prepared for Alta Windpower Development by CH2M HILL, Santa Ana, California.

2011 *Cultural Resources Monitoring and Mitigation Plan: Oakley Generating Station Project. CH2M HILL, Santa Ana California.* Prepared for Contra Costa Generating Station, LLC and California Energy Commission.

2011 *Cultural Resources Monitoring and Mitigation Plan: Mariposa Energy Project. CH2M HILL, Santa Ana California.* Prepared for Mariposa Energy, LLC and California Energy Commission.

2011 *Cultural Resources Literature Search for the All American Canal Service Bridge, Calexico, California.* CH2M HILL, Santa Ana, California. Prepared for the Imperial Irrigation District and Federal Emergency Management Agency.

2010 *Cultural Resources Monitoring and Mitigation Plan: Ivanpah Solar Electric Generating System. CH2M HILL, Santa Ana, California.* Prepared for Solar Partners I, LLC; Solar Partners II, LLC; and Solar Partners VIII, LLC, U.S. Bureau of Land Management, and California Energy Commission.

2010 *Cultural Resources for the SNG Suwannee Pipeline Project, Alabama, Georgia and Florida. CH2M HILL, Santa Ana, California.* Prepared for Southern Natural Gas Company.

2010 *Cultural Resources Monitoring and Mitigation Plan: Almond 2 Power Plant Project. CH2M HILL, Santa Ana California.* Prepared for Turlock Irrigation District and California Energy Commission.

2010 *Devers-Palo Verde No. 2 Transmission Line Project: Construction Transportation Plan – Devers Yard.* Prepared for Southern California Edison. Prepared by CH2M HILL, Santa Ana, California.

2010 *Memorandum: Tehachapi Renewable Transmission Project Preconstruction Photographic Documentation Mesa Material Storage Yard.* Prepared for Southern California Edison. Prepared by CH2M HILL, Santa Ana, California.

2010 *Cultural Memo for the Schuyler Heim Bridge Replacement and SR 47 Expressway Project - Documentation of Project Description Changes to Land Use, Recreation, and Coastal Zone.* Prepared for Caltrans District 7. Prepared by CH2M HILL, Santa Ana, California.

2010 *Devers-Palo Verde No. 2 Transmission Line Project: Construction Specifications.* Prepared for Southern California Edison. Prepared by CH2M HILL, Santa Ana, California.

2010 *Memorandum: Tehachapi Renewable Transmission Project Preconstruction Photographic Documentation Segment 8 Telecom.* Prepared for Southern California Edison. Prepared by CH2M HILL, Santa Ana, California.

2010 *Phase II Cultural Resources Evaluation of EAFB-3897 (CA-LAN-2692, 19-002692), Air Force Plant 42, Los Angeles County, California*. Submitted to the Base Historic Preservation Office, Edwards AFB.

Gloriella Cardenas, M.A., RPA

2010 *Hidden Hills Project Fatal Flaw Analysis (Cultural)*. Prepared for Bright Source Energy, Oakland, California. Prepared by CH2M HILL, Santa Ana, California.

2009 *Cultural Resources Inventory Report for the 9.02 Acre Turner Parcel (Assessors Parcel Number 686-040-021), Section 2, Township 5 South, Range 4 East, Agua Caliente Indian Reservation, City of Palm Springs, Riverside County, California.* Submitted to the Agua Caliente Band Of Cahuilla Indians, Tribal Historic Preservation Office, Palm Springs, California.

2009 *Cultural Resources Inventory Report for the 52.27 Acre Andreas Cove Parcels (Assessors Parcel Numbers 686-040-024, 686-040-025, 686-040-026, and 686-040-027), Section 2, Township 5 South, Range 4 East, Agua Caliente Indian Reservation, City of Palm Springs, Riverside County, California.* Submitted to the Agua Caliente Band Of Cahuilla Indians, Tribal Historic Preservation Office, Palm Springs, California.

2009 *Cultural Resources Inventory Report for the 8.45 Acre Turner Parcel (Assessors Parcel Number 686-040-006), Section 2, Township 5 South, Range 4 East, Agua Caliente Indian Reservation, City of Palm Springs, Riverside County, California.* Submitted to the Agua Caliente Band Of Cahuilla Indians, Tribal Historic Preservation Office, Palm Springs, California.

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Clint Helton, RPA

Senior Cultural Resources Specialist

Education

M.A., Anthropology, Brigham Young University
B.A., Language and Literature, University of Utah

Professional Registration

Registered Professional Archaeologist (1999, No. 11280)

Distinguishing Qualifications

- 14 years of experience conducting environmental impact evaluations, with particular expertise in conducting cultural resources studies in California, Arizona, Nevada, and Utah
- Extensive experience in regulatory compliance, cultural resources, National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance activities
- Highly experienced managing cultural resources studies for large linear utility, energy, and transportation projects

Relevant Experience

Mr. Helton has more than 14 years of environmental management experience in the United States. He has a strong background in environmental impact evaluations, having directed technical studies; negotiated with lead agencies, responsible agencies and clients; and has written, edited, and produced a substantial number of environmental review and technical documents. Mr. Helton frequently acts as a senior technical advisor and senior reviewer for projects and clients throughout the United States, with particular expertise in Arizona, California, Nevada, and Utah.

His knowledge of regulatory compliance and cultural and paleontological resources enables him to manage National Environmental Policy Act (NEPA) and National Historic Preservation Act (NHPA) compliance activities and document preparation. Mr. Helton is a particularly skilled practitioner of federal regulations governing treatment of cultural resources, especially Section 106 of NHPA (36CFR800) and the Native American Graves Protection and Repatriation Act (NAGPRA) (43CFR10). Mr. Helton has significant expertise conducting consultation with State and Federal agencies, as well as facilitating formal government-to-government consultation with Native American groups and tribes throughout the western U.S. Mr. Helton has authored numerous environmental technical reports, cultural resources management plans, cultural resources studies, Programmatic Agreements, Memorandums of Understanding (MOU), and contributed to many NEPA documents for a variety of private and public sector clients.

Mr. Helton is experienced with the challenges of preparing environmental documentation for large linear utility and transportation projects and is familiar with the process and guidelines of the California Energy Commission (CEC) and Federal Energy Regulatory Commission (FERC), Western Area Power Administration (WAPA), Bureau of Land Management (BLM), US Forest Service, Bureau of Indian Affairs (BIA) among others.

Clint Helton, RPA

Additionally, Mr. Helton has conducted environmental impact assessment in Mexico. Mr. Helton is native-level bilingual in Spanish and has extensive knowledge of many Spanish-speaking countries.

Representative Projects

Task Lead, Tonto National Forest Control Road Bridge Replacement Project, Gila County, Arizona. Conducting cultural resources study in compliance with Section 106 of the National Historic Preservation Act. Coordination with Central Federal Lands, US Forest Service, Arizona SHPO, and consultation with Gila County, Arizona. Preparation of technical report.

Task Manager, US Border Patrol; Customs and Border Protection, Facilities Expansion, Multiple Locations Along United States Southern Border. Lead preparation of numerous cultural resources studies in support of NEPA Environmental Assessments and Phase I Environmental Site Assessments in support of US Border Patrol facility expansion projects along the US/Mexico border. Included investigations for facilities in New Mexico, Texas, Arizona, and California. Received "Exceptional" performance rating.

Task Manager/Principal Investigator, SolarReserve, Rice Solar Energy Project, San Bernardino County, California. Assisted with preparation of AFC for CEC in support of a large proposed solar power generation facility covering over 4,000 acres of land managed by the Bureau of Land Management in San Bernardino County, California. Lead Federal agency is WAPA and also included BLM coordination. Responsible for preparation of cultural resources component of project, including archival research, field surveys, report preparation, and conducting Native American consultation.

Project Principal; Parker to Blythe Transmission Line Project; Western Area Power Administration; Imperial County, California. Provided overall management of cultural resources services for the Parker-Blythe #1 161-kilovolt (kV) transmission line project. The inventory extended from Blythe, California, to Parker, Arizona. A total of 147 sites (136 in California and 11 in Arizona) were recorded.

Task Manager, BrightSource Energy, Ivanpah Solar Electric Generating System Project, San Bernardino County, California. Assisted with preparation of AFC for CEC in support of a large proposed solar power generation facility covering over 4,000 acres of land managed by the Bureau of Land Management in San Bernardino County, California. Responsible for preparation of cultural resources component of project, including archival research, field surveys, report preparation, and conducting Native American consultation.

Task Manager, National Science Foundation National Ecological Observation Network (NEON); Multiple Locations in Continental United States (AL, AZ, CA, CO, KS, MA, MD, MI, MN, NH, NM, FL, GA, OK, TX, WA, WI, VA) and Hawaii, Alaska, and Puerto Rico. Task Lead and overall management of a large national cultural resources study in support of NEPA Environmental Assessment. The study is analyzing environmental impacts of a large and comprehensive network of scientific infrastructure located in a variety of ecological zones designed to monitor environmental conditions and to provide data on climate change. Work included archival research, field visits, and coordination with applicable state archives and preparation of correspondence to multiple SHPO's.

Task Manager, Terra-Gen LLC Alta Wind Project, Kern County, California. Task Lead, quality control manager, and overall management of cultural resources studies for this 5,000-acre-plus alternative

Clint Helton, RPA

energy development project near the City of Tehachapi, Kern County, California. Provide regulatory guidance, regional technical expertise in cultural resources and coordination with Kern County. Supervised inventory for cultural resources, technical report preparation, and conducted Native American Consultation.

Task Manager, Iberdrola Renewables, Multiple Solar Energy Development Projects, Arizona, California, New Mexico, and Nevada. Led preparation of cultural resources assessments for solar power generation facilities in Arizona, New Mexico, Nevada, and California. Mr. Helton is acting as principal investigator for several critical issues analyses as well as full permit preparation of solar energy development projects in Arizona, California, Nevada, and New Mexico. Project acreages range from 5,800 acres to 35,000 acres.

Task Manager, PPM Energy, Solar Energy Development, Arizona, Nevada, California. Cultural resources assessments for solar power generation facilities in Arizona, Nevada, and California. Mr. Helton is acting as principal investigator for literature searches and field visits for several proposed solar energy projects in Arizona, California, and Nevada. Project acreages range from 2,000 acres to 25,000 acres.

Professional Organizations/Affiliations

Association of Environmental Professionals
Register of Professional Archaeologists
Society for American Archaeology
American Anthropological Association

Training and Certifications

CEQA Training
NEPA Training
Section 106/NHPA Training
Federal Antiquities Permit in Arizona, California, Oregon, Washington, Utah, and Nevada

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Curriculum Vitae

Michelle Kaye

Home Address:
1300 Southampton Rd., #104
Benicia, CA. 94510
(707) 746-7871 (h)
(707) 315-6013 (c)
Email: mkaye_1@yahoo.com

Citizenship: U.S. Citizen and Canadian Citizen (dual nationality)

- ✓ Qualifications: Physical Anthropologist/Archaeologist with a strong background in cultural resource management, including producing reports to comply with NEPA, NHPA, CEQA, and NAGPRA. Over 10 years of experience conducting archaeological field and laboratory research, including experience with federal and defense contracts. Specialized training in human and faunal osteological analysis, forensic anthropology, forensic archaeology, DNA analysis, and journalism. Over 11 years of experience as a journalist. Recipient of a Lucas Foundation Research Grant, Forensics Science Foundation (2003) and the Geist Fund Grant (2007) among others.

Education:

2008:	Ph.D., Biological Anthropology. University of Alaska Fairbanks, P.O.B. 757500, Fairbanks, AK. 99775. Advisor: Dr. Joel Irish.
2003:	M.A., Biological Anthropology. San Francisco State University, 1600 Holloway Avenue, San Francisco, CA. 94132. Advisors: Drs. Steve Gabow and Mark Griffin.
1993:	B.A., Anthropology, emphasis in Archaeology. San Francisco State University, 1600 Holloway Avenue, San Francisco, CA. 94132. Advisor: Dr. Steve Gabow
1993:	B.A., Journalism. San Francisco State University, 1600 Holloway Avenue, San Francisco, CA. 94132. Advisor: Dr. John Burks.

Additional Education:

Winter 2011:	American Academy of Forensic Sciences, 63rd Annual Meeting, Chicago IL. Completed workshops in Geometric Morphometrics and Digitizing, and in Fordisc 3.1.
Winter 2010:	American Academy of Forensic Sciences, 62nd Annual Meeting, Seattle, WA. Completed workshop in The Forensic Investigation of Human Remains from Armed Conflicts and Catastrophes.
Winter 2009:	American Academy of Forensic Sciences, 61st Annual Meeting, Denver, CO. Completed workshop in Advances in Archaeological Approaches to Crime Scene Investigation.
Winter 2008:	American Academy of Forensic Sciences, 60th Annual Meeting, Washington, D.C. Completed workshop in Measurements, Statistics, Terminology, and Quantitative Methods: Uses and Interpretations in Physical/Forensic Anthropology.

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Winter 2007:	American Academy of Forensic Sciences, 59th Annual Meeting, San Antonio, TX. Completed a workshop in Restorative Dentistry as Evidence, and a workshop in Missing Persons.
Winter 2006:	American Academy of Forensic Sciences, 58th Annual Meeting, Seattle, WA. Completed a workshop in Advanced Topics in STR DNA Analysis, and a workshop in Recovery, Examination, and Evidence of Decomposed and Skeletonized Bodies: an Anthropological and Entomological Approach.
Winter 2005:	American Academy of Forensic Sciences, 57th Annual Meeting, New Orleans, LA. Competed workshop in Quality Assurance in Forensic Anthropology.
Winter 2004:	American Academy of Forensic Sciences, 56th Annual Meeting, Dallas, TX. Completed workshop in Forensic Human Mitochondrial DNA Analysis.
Summer 2003:	International Association for Identification, 88th International Education Conference, Ottawa, Canada. Certificate received in Forensic Entomology and the Crime Scene, Development of Latent Prints with Titanium Dioxide, and certificate received in DNA Unraveled: A Practical Guide to Crime Scene Investigators.
Winter 2003:	American Academy of Forensic Sciences, 55th Annual Meeting, Chicago, IL. Certificates received in Extracting DNA from Challenging Sample Materials and in Low Copy Number DNA Analysis.
Fall 2002:	County of Los Angeles Department of the Coroner, Los Angeles County Coroner Seminar, Los Angeles, CA. Certificate Received in Handling Death in a Diverse Society.
Summer 2002:	International Association for Identification, 87th International Educational Conference, Las Vegas, NV. Certificates received in Forensic Archaeology, Scattered Human Remains and Forensic Archaeology, Buried Human Remains.
Summer 2002:	Disaster Mortuary Operational Response Teams Regional Training Session, Region 9, Laughlin, Nevada. Attended discussions on the use of Disaster Portable Mortuary Units, site recovery, identification of unattached body parts, and the computerized Victim Identification Program.
Summer 2000:	University of New Orleans, New Orleans, LA. and Southern Institute of Forensic Science. Certificate received in Basic Forensic Pathology for Law Enforcement, Death Investigators, and Health Care Professionals.
Summer 1999:	University of New Orleans, New Orleans, LA. and Southern Institute of Forensic Science. Certificate received in Advances in Forensic Anthropology.
Summer 1998:	University of New Orleans, New Orleans, LA. and Southern Institute of Forensic Science. Certificate received in Basic Forensic Anthropology.
Summer 1997:	University of California at Berkeley, Berkeley, CA. Completed course in Archaeological Field Methods. PI: Dr. Laurie Wilke, U.C. Berkeley Department of Anthropology. Excavation conducted on an 1860's homestead and commercial development located within Annadel State Park in Sonoma County, CA.

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Anthropology/Academic Employment:

April 2011 – June 19, 2011: Analytical Environmental Services. Senior Archaeologist. 1801 7th Street Suite 101, Sacramento, CA. 95811. Supervisor: Miss Ryan Lee. Phone: (916) 447-3479. (Duties: Archaeological field and laboratory work, cultural resource management compliance, including writing reports to comply with CEQA, NEPA, NHPA, and NAGPRA.)

August 2010 – April 2011: Chambers Group Inc. Senior Cultural Resources Specialist/Lead Archaeologist, U.S. Army National Training Center, Fort Irwin. NTC-DPW-Environmental-Cultural Resources. IMWE-IRW-PWE P.O. Box 105085 – Fort Irwin, CA. 92310-5085. Supervisor: Dr. Bob Yelin Phone: 818-388-1705. Email: byelin@chambersgroupinc.com. (Duties: Supervise a staff of six archaeologists. Direct experience with all aspects of archaeology, including compliance with archaeological legislation including NEPA documentation, sections 106 and 110 of NHPA, archaeological surveys, site recordation, test excavation, and site evaluation for eligibility to the National Register of Historic Places. Human and faunal osteological analysis. Contact point for multiple agencies and contractors.)

July 2010 – August 2010: U.S. Department of the Interior. U.S. National Park Service. Aztec Ruins National Monument. Archaeologist. Address: 84 County Road 2900 "Ruins Road" Aztec, New Mexico 87410. Supervisor: Mr. Gary Brown. Phone: 505-334-6174. Email: Gary_Brown@nps.gov. (Duties: Archaeological excavation, identification, and inventory of archaeological resources, cultural resource management, ruins stabilization, and scientific research and interpretation of archaeological resources.)

March 2008 – September 2010: University of California Medical Center San Francisco. Department of Orthopaedic Surgery. UCSF/SFGH Orthopaedic Trauma Surgical Training Facility. Research Assistant IV. Address: San Francisco General Hospital, Department of Orthopaedic Surgery, University of San Francisco, 1001 Potrero Ave., Room 3A36, San Francisco, CA 94110. Supervisor: Mr. John Houston III, Division Manager. Phone: 415-206-8812. Email houstonj@orthosurg.ucsf.edu. (Duties: Dissection and prosection of cadavers, suturing cadavers, biomechanical research, assisting surgeons and engineers in the testing and validation of hardware on human cadavers to repair bone fractures, familiarization with orthopaedic surgical instrumentation, operation of robots for the testing of hardware, reading radiographs, operation of Philips X-ray/Fluoroscope, Philips C-Arm, Philips 3-D C-Arm, and Orthoscan Mini C-Arm.)

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February 2010:	Paleo Solutions. Archaeologist. Address: 2035 Palcentia Avenue, Suite D, Costa Mesa, CA. 92627. Supervisor: Scott Armstrong, Vice President. 526-818-7713. (Duties: Contract position. Conducted an archaeological survey along Segment 8 of the Tehachapi Renewable Transmission Project in Los Angeles and San Bernardino Counties for Southern California Edison under subcontract to Pacific Legacy. Documented historical artifacts. Project area approx. 35 miles.)
March 17, 2009-Oct. 31, 2009:	Cogstone Resource Management, Inc. Cultural Resource Management. Field Supervisor Tehachapi Renewable Transmission Project, Los Angeles and Kern County, California. Address: 1518 West Taft Avenue, Orange, CA. 92685. Field Director: David Morrill Phone: (714)-743-9206. (Duties: Supervised a team of cross-trained archaeology and paleontology field monitors in several locations in and around the Mojave Desert and Angeles National Forest, conducted as-needed archaeological surveys and field monitoring for Southern California Edison under subcontract to Pacific Legacy. Duties included reporting on site conditions, soil/geologic analysis, human and faunal osteological analysis, site recordation, site mitigation, data recovery, and documentation for environmental and archaeological impact studies. Knowledge of legislation affecting archaeological projects, incl. NEPA, CEQA, and NHPA, esp. sections 106 and 110. Served as a contact point for multiple agencies and contractors. Total project area encompassed more than 75 linear miles. Additional projects: Pixar Construction site, Emeryville, CA.)
May 2006 – Aug. 2006:	Holman and Associates, Archaeological Consultants. Archaeologist. Address: 3615 Folsom Street, San Francisco, CA. 94110. Phone: 415-550-7286. Supervisor: Mr. Randy Wiberg, Principal Investigator. Phone: 650-588-3104. Email: Rwiberg@comcast.net. (Duties: Part of a team that excavated approx. 400 human burials from a Paleo-Indian site. Survey, test pits, excavation of human remains, faunal and osteological analysis, map reading, creation of profile maps, compass reading, collection of samples for floatation, screening, accurate detailed recording of field notes, field interpretation strategies, and knowledge of legislation pertaining to archaeology (NEPA, CEQA, NHPA, and NAGPRA.)
Aug. 2005 - Dec. 2005:	University of Alaska Fairbanks, Department of Anthropology. Graduate Teaching Assistant, Human Osteology. Address: University of Alaska Fairbanks, 310 Eielson Building, P.O.B. 757720, Fairbanks, AK. 99775-7720. Supervisor: Dr. Joel D. Irish, Professor of Biological Anthropology. Phone: 907-474-6755. Email: ffjdi@uaf.edu. (Duties: Assisting with laboratory instruction in human and faunal osteology, giving occasional lectures, grading papers and examinations, holding office hours, answering student questions, organizing study sessions, supervising classroom, and processing faunal remains.)

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Sept. 2004 - May 2005:	Center for Alaska Native Health Research. Graduate Research Assistant. Address: Institute of Arctic Biology, Irving 1, rm. 311, Box 757000, University of Alaska Fairbanks, Fairbanks, AK. 99775-7000. Supervisor: Dr. Cécile Lardon, Project PI. Phone: 907-474-5272. Email: cecile@canhr.uaf.edu. Salary $16.00/hr. Hours: 20/wk. (Duties: Statistical analysis of biological and social support data using SPSS. Helped initiate a community-based support and educational system to address diabetes and obesity in seven Yu'pik villages. Academic journal and internet research, generating memos, reports, PowerPoint presentations, and supervising one employee.)
Jan. 2003 - May 2004:	University of Alaska Fairbanks, Department of Anthropology. Graduate Teaching Assistant, Cultural Anthropology. Address: University of Alaska Fairbanks, 310 Eielson Building, P.O.B. 757720, Fairbanks, AK. 99775-7720. Email: fyanth@uaf.edu. Supervisor: Dr. Patty A. Gray, Affiliate Associate Professor of Cultural Anthropology. Phone: +353-1-708-6084. Email: patty.gray@nuim.ie. (Duties: Instructor for three discussion sections of Cultural Anthropology 100X approx. 35 students each, Teaching Assistant to large seminar on the same topic, giving lectures, grading papers and examinations, holding office hours, answering student questions, organizing study sessions, and supervising classroom.)
Aug. 2000 – Dec. 2000:	San Francisco State University, Department of Anthropology. Graduate Research Assistant, Biological Anthropology. Address: San Francisco State University, Department of Anthropology, 1600 Holloway Avenue, San Francisco, CA. 94132. Supervisor: Dr. Steve Gabow, Professor of Anthropology Emeritus. Phone: 415-338-2046. Email: antho@sfsu.edu. (Duties: Assisting professor with instruction in biological anthropology, giving occasional lectures, grading papers and examinations, holding office hours, answering student questions, organizing study sessions, and supervising large classroom, approx. 200 students.)
Sept. 1998 – May 2000:	San Francisco State University, Department of Anthropology NAGPRA Compliance Project. Graduate Research Assistant. Address: San Francisco State University, Department of Anthropology, 1600 Holloway Avenue, San Francisco, CA. 94132. Supervisor: Dr. Jeffrey B. Fentress, NAGPRA Director. Phone: 415-338-3075. Email: fentress@sfsu.edu. (Duties: Identification and analysis of human remains for NAGPRA compliance. Creation of biological profile. Determination of age, sex, ancestry, stature, and trauma of individuals from human skeletal remains. Cataloguing remains. Writing official NAGPRA reports on results of osteological analysis. Identification of common bone pathologies. Transcription of interviews with Native Americans. Expert on NAGPRA regulations.)

Michelle Kaye

Jan. 2000 – May 2000:	San Francisco State University, Department of Anthropology. Graduate Research Assistant, Biological Anthropology. Address: San Francisco State University, Department of Anthropology, 1600 Holloway Avenue, San Francisco, CA. 94132. Supervisor: Dr. Steve Gabow, Professor of Anthropology Emeritus. Phone: 415-338-2046. Email: antho@sfsu.edu. (Duties: Assisting professor with instruction in biological anthropology, giving occasional lectures, grading papers and examinations, holding office hours, answering student questions, organizing study sessions, and supervising large classroom, approx. 200 students.)
Sept. 1998– May 2000:	San Francisco State University, Department of Biology. Research Assistant, Anatomy Laboratory. Address: San Francisco State University, Department of Biology, Hensill Hall 534, 1600 Holloway Avenue, San Francisco, CA. 94132. Supervisors: Mr. Jett Chin, Laboratory Instructor, Biology. Phone: 415-338-1549. Mr. Lawrence Okumoto. Phone: 408-390-0760. Email: hinagata@hotmail.com. (Duties: Instruction in osteology. Assisting anatomy students with dissection of human cadavers and processing human remains. Macerating human and faunal remains, processing remains by heating to remove all tissue. Identification, organization, and rejoining of isolated bone components. Maintenance of a (dermestid) beetle colony.)
May 1998 – Aug. 1998:	University of California at Berkeley, Department of Anthropology. Research Assistant to Graduate Student in the Department of Anthropology. Archaeologist/Laboratory Assistant. Address: University of California at Berkeley, Department of Anthropology, 232 Kroeber Hall, Berkeley, CA. 94720-3710. Phone: 510-642-3392. Fax: 510-643-8557. (Duties: Supervised undergraduate students in the field. Excavation and test pits conducted at an 1860's homestead, a small historic cabin and at stone quarries, dating from 1887 to 1913, located within Annadel State Park in Sonoma County, CA., Test pits, excavation, faunal and human osteological analysis, map reading, creation of profile maps, compass reading, screening, accurate detailed recording of field notes, field interpretation strategies, and knowledge of legislation pertaining to archaeology.)
May 1997 – Aug 1997:	University of California at Berkeley, Department of Anthropology. Archaeologist/Laboratory Assistant (Field School). Address: University of California at Berkeley, Department of Anthropology, 232 Kroeber Hall, Berkeley, CA. 94720-3710. Supervisor: Dr. Laurie Wilkie. Professor of Archaeology. Phone: 510-643-0677. Email: lawilkie@berkeley.edu. (Duties: Excavation and test pits conducted at an 1860's homestead, a small historic cabin and at stone quarries, dating from 1887 to 1913, located within Annadel State Park in Sonoma County, CA. Site survey, use of transit, test pits, excavation, faunal osteology, map reading, creation of profile maps, compass reading, screening, accurate detailed recording of field notes, cleaning and curation of artifacts, field interpretation strategies, and knowledge of legislation pertaining to archaeology.)

Michelle Kaye

Journalism Employment:

Aug. 1994 – May 2000:	Contra Costa Times Newspapers/Knight Ridder. Journalist. Address: 1 Harold Court, Walnut Creek, CA. 94597. Editor: Mr. David Weinstein. Phone: 925-933-1717. Email: davidsweinstein@yahoo.com. Hours: varied. (Duties: Generating and writing stories on people and places primarily in the San Francisco Bay Area. Writing published in several sections, including Business, Community News, Health/Science, Travel/Outdoors, Features and Special Sections. Stories published in Contra Costa Times, West County Times, Valley Times, Ledger Dispatch, and San Ramon Valley Times. (Dailies). Stories also published in the Contra Costa Times magazine: Discover the Delta.)
July 1998 - Oct. 1998:	USA Hosts Destination Services. Contract Writer. Address: 657 Mission Street, Suite 202, San Francisco CA. 94105. Phone: 415-695-8000. Email: sales@usahosts.com. Hours: varied. (Duties: Responsible for updating and revising USA HOSTS Tours and Activities Tariff, delivering accurate information on tours, museums, sights, restaurants, hotels, convention facilities, and banquet options for corporate clients visiting the Bay Area.)
Oct. 1997 - April 1998:	Fodor's Travel Publications. Travel Writer. 1745 Broadway, 15th floor, New York, NY 10019. Hours: 40/wk. (Duties: Responsible for writing introduction to California and for updating and revising material covering the Sierra Nevada and Eastern Sierra, delivering accurate information on tourist resources, transportation, museums and sights, restaurants, hotels, and outdoor activities. Material published in Fodor's California 1999, as well as in the San Francisco city guide.)
May 1996 – Aug. 1996:	Fodor's Travel Publications. Travel Writer. 1745 Broadway, 15th Floor, New York, NY 10019. Hours: 40/wk. (Duties: Responsible for updating and revising material covering the Sierra Nevada and the San Joaquin Valley, L.A. Environs and Coast, Palm Springs, and the California Desert, delivering accurate information on tourist resources, transportation, museums and sights, restaurants, hotels, and outdoor activities. Material published in The Berkeley Guides to California, as well as the San Francisco and Los Angeles city guides.)
Aug. 1994 – June 1995:	The Inter-City Express/Daily Journal Corporation. Reporter. Address: 1109 Oak Street, Ste. 103, Oakland, CA. 94607-4917. Phone: 510-272-4747. (Duties: Reporting on real estate, legislative issues related to construction, finance, crime/homicides in Oakland, Oakland city government, and human interest.)
March 1993 – March 1995:	The Nose Magazine. Writer/Intern. San Francisco, CA. Editor: Mr. Jack Boulware. (Duties: Writing for various magazine sections. Editing under deadline pressure, research, fact-checking, typing, phones, mailings, filing, and general office support.
July 1994 – Nov. 1994:	Diabetes Interview. Staff Writer. San Francisco, CA. (Duties: Medical writing on advances in the care and treatment of diabetes, academic research, fact checking, and editing.)

Michelle Kaye

Sept. 1993 – Oct. 1993:	The Polk Street Express. Staff Writer. San Francisco, CA. (Duties: Reporting on the Polk Street area, and interviewing local residents, generating stories for publication, editing, research and fact-checking.)
Sept. 1993 – Oct. 1993:	The New Fillmore. Staff Writer. Address: 2130 Fillmore Street , #202, San Francisco, CA. 94115 415-441-6070. Email: editors@newfillmore.com. (Duties: Reporting from a community perspective, writing feature and news stories for publication, editing, fact checking, and research.)
Sept. 1993:	The Petaluma Argus-Courier. Freelance Writer. Address: P.O.B. 1091, Petaluma, CA., 94953. Phone: 707-776-8453. Email: csamson@arguscourier.com. (Duties: Reporting on bike helmet safety: laws and regulations after the death of two Petaluma youngsters in biking accidents.)
Jan. 1991 – May 1992:	Prism Magazine. Staff Writer. Address: San Francisco State University, Department of Journalism, Humanities 305, 1600 Holloway Avenue, San Francisco, CA, 94132. Email: jour@sfsu.edu. Editor: Dr. John Burks, Professor of Journalism. Phone: 415-338-1689. Email: jburks@sfsu.edu. (Duties: Writing feature stories, a travel column, restaurant reviews, and reporting on San Francisco trends. Editing, fact-checking, research, conducting interviews, laying out the magazine, and photography.)
Oct. 1989:	Golden Gater Newspaper. Freelance Writer. Address: San Francisco State University, Department of Journalism, Humanities 305, 1600 Holloway Avenue, San Francisco, CA, 94132. Email: jour@sfsu.edu. Editor: Dr. John Burks, Professor of Journalism. Phone: 415-338-1689. (Duties: Reporting on the aftermath of the Loma Prieta earthquake, generating stories for publication, fact-checking, editing, and research)

Grants and Awards Received:

Geist Fund Grant. Grant entitled: Molecular Identification and Analysis of Treponematosis in Ancient Mummified Remains from Northern Chile and Southern Peru. 2007 ($1,000)

University of Alaska Fairbanks, Anthropology Department Fellowship, 2006 ($6,050)

Graduate Chancellor Assistantship, 2006 ($2,196)

University of Alaska Fairbanks, Travel Grant, 2005 ($600)

Lucas Foundation Research Grant, Forensic Sciences Foundation 2003, ($2,500). Grant entitled DNA Degradation in Progressively Burned Human Bone and Tissue: Recognition of Techniques for Optimal DNA Sequence Analysis. Grant awarded to (PI) Ms. Michelle Kaye, Ms. Elayne Pope, Dr. Frank Cipriano, and Dr. O.C. Smith.

Anthropology Department, San Francisco State University, Research Fund: 2000, ($700) for Ancient DNA Research.

Michelle Kaye

California State University Grant, 1997 ($948), 1998 ($1,584), 1999 ($1,506), 2000 ($438).

College of Behavioral and Social Sciences, Grant for Graduate Research, 1999 ($500)

Journalism Department, San Francisco State University, Award for Article Writing, spring 1993.

California Intercollegiate Press Association, Gold Press Card, Best Magazine Human Interest (Prism), 1992.

America-Israeli Friendship League Young Journalist's Exchange Program in Israel, 1992

Contiki Tours International Travel Writing Contest, Spring 1991.

Medal Winner Santa Rosa Press Democrat Editorial Contest, Spring 1988.

Public Speaking Finalist, Sonoma County, Spring 1988.

Reports and Publications:

Molecular Identification and Analysis of Treponematosis (Syphilis, Bejel, Yaws, or Pinta) in Ancient Mummified Remains from Northern Chile and Southern Peru. Ph.D. Dissertation. University of Alaska Fairbanks, Department of Anthropology, Fairbanks, AK. 2008.

Possible Treponematosis in the Nanjemoy Ossuaries, Maryland. Master's Thesis, San Francisco State University, Department of Anthropology, San Francisco, CA. 2003.

Osteological Analysis of Human Remains from Alameda sites (4-Ala-12, 4-Ala-13). Dr. Jeff Fentress, Ms. Julie Lopez, and Ms. Michelle Kaye. A report prepared for the NAGPRA Inventory, Department of Anthropology, San Francisco State University, San Francisco, CA. 1999.

Osteological Analysis of Human Remains from Alameda sites (4-Ala-328, 4-ALA-329). Dr. Jeff Fentress, Ms. Julie Lopez, Ms. Michelle Kaye, and Mr. Nathan Holton. A report prepared for the NAGPRA Inventory, Department of Anthropology, San Francisco State University, San Francisco, CA. 1999.

Chemical Contamination of Repatriated Native Californian NAGPRA Materials. Wrote and designed materials for conference held at San Francisco State University, San Francisco, CA. Sept. 30-Oct. 1, 2000.

Numerous reports produced for the U.S. Army, National Training Center/Fort Irwin for cultural resource management compliance. Reports available upon request.

Michelle Kaye

Archaeology Projects:

*Annadel State Park, Sonoma, CA.
*Shea Homes, Trilogy Subdivision, Brentwood, CA.
*Tehachapi Renewable Transmission Project, multiple locations in Southern California.
*Aztec Ruins National Monument, Aztec, NM
*Fort Irwin National Training Center, Fort Irwin, CA.
*Auburn Indian Rancheria Tribal Project, Auburn, CA.
*Coyote Valley Indian Reservation, Redwood Valley, CA.
*Pauma Indian Reservation, Pauma Valley, CA.
*San Jose Water Company, San Jose, CA.
*Half Moon Bay, Vicente Creek Water Diversion, Half Moon Bay, CA.
*Wheeler Island, Solano County, CA.
*Calaveras Telephone, Calaveras County, CA.
*Lake Natoma Bike Trail, Folsom, CA.

Abstracts:

Mercury in Ancient Human Hair from a Chilean Mummy. Ms. Michelle Kaye, Dr. Joel Irish, Dr. Bernardo Arriaza, and Dr. Lawrence Duffy. Results of mercury analysis on a northern Chilean Chinchorro mummy. Results compared to mummies from the Karluck archaeological site in Kodiak, AK. and Barrow, AK. to provide comparative examples of dietary mercury exposure. Arctic Science Conference, Fairbanks, AK. October 2-4, 2006. (Supported in part by NSF-OCE 0525275)

Public Presentations:

Molecular Identification and Analysis of Treponematosis (Syphilis, Bejel, Yaws, or Pinta) in Ancient Mummified Remains from Northern Chile, presented at the annual meeting of the Mountain, Desert, Coastal Forensic Anthropologists, Lake Mead, NV. May 2007.

Molecular Identification and Analysis of Treponematosis (Syphilis, Bejel, Yaws, or Pinta) in Ancient Mummified Remains from Northern Chile and Southern Peru, presented at the University of Alaska Fairbanks, Fairbanks, AK. March 2007.

An Experimental Test of the Accuracy of Human Forensic Identification Techniques for Analysis of Burn-damaged Bone and Tissue, presented at the American Academy of Forensic Sciences annual meeting, New Orleans, LA. February 2005.

The Role of the Forensic Anthropologist, presented at City College of San Francisco, San Francisco, CA. February 2001.

Possible Treponematosis in the Nanjemoy Ossuaries, Maryland, presented at San Francisco State University, San Francisco, CA. Fall 2001.

Introduction to Archaeology, presented at Petaluma Valley Academy, Petaluma, CA. Fall 1999.

Additional Archaeological Experience:

Oct. 2006: Archaeologist: University of Alaska Fairbanks. Supervisor: Dr. Joel Irish. Excavation of Alaskan Honor Chief Nagita from an unmarked grave in Fairbanks, AK. Work conducted for Alaska Natives from Nenana, AK.

Michelle Kaye

Oct. 2005:	Search Crew: University of Alaska Fairbanks. Supervisor: Dr. Joel Irish. Assisted Alaska State Troopers in the search for a clandestine grave in Fairbanks, AK.

Molecular/Anthropological Research/Contract Work:

2011:	"Elemental Analysis, Mineralogical Analysis, and DNA Recovery from Progressively Burned Human Bone and Tissue." A grant submitted to the National Institute of Justice in response to grants relating to "Research and Development on Instrumental Analysis for Forensic Science Applications." Drs. Greg Hampikian, Mike Davis, Matthew Kohn, Lisa Nelson, Michelle Kaye, and Celina Suarez.
2011:	"Signatures of Burn History: Elemental Analysis, Mineralogical Analysis, DNA Profile Changes, and Electron Microscopy of Progressively Burned Human Bone and Tissue. A grant submitted to the National Institute of Justice, in response to solicitation for grants relating to "Basic Scientific Research to Support Forensic Science for Criminal Justice Purposes." Drs. Greg Hampikian, Matthew Kohn, Michelle Kaye, Elayne Pope, Paul Olin, Samantha Evans, and Laura Wendell.
2008-2010:	Variation in femur subtrochanteric shape in Alaska Natives. Research undertaken at the American Museum of Natural History, Department of Physical Anthropology, New York, NY. Results compared to various ancestral groups. Work conducted with Drs. Daniel Westcott and George W. Gill.
2006:	Molecular analysis of three shrunken heads from Ecuador. Research conducted to determine through mtDNA analysis whether the skin covering the crania is human. Laboratory research conducted at the Conservation Genetics Laboratory at San Francisco State University, San Francisco, CA.
2006:	Molecular analysis of ancient mummies from northern Chile. Research conducted to recover mtDNA and to test for treponematosis, tuberculosis, and leprosy. Molecular analysis conducted at the Paleo-DNA Laboratory, Northern Ontario Technology Center, Thunder Bay, Ontario (Canada). Bioarchaeological research conducted investigating a possible relationship between treponematosis in the Chinchorro mummies and their mortuary rituals. Osteological analysis conducted at the Museo San Miguel de Azapa in Arica, Chile.
2006:	Recovery of mtDNA and nuclear DNA from an ancient Egyptian mummy. Analysis conducted at the Paleo-DNA Laboratory, Northern Ontario Technology Center, Thunder Bay, Ontario (Canada).
2006:	Analysis of mtDNA from a 100-year-old skeleton from Nenana, AK. Analysis undertaken for the family of Chief Nagita. Analysis conducted at the Paleo-DNA Laboratory, Northern Ontario Technology Center, Thunder Bay, Ontario (Canada).
2003:	Lucas Research Foundation Grant entitled DNA Degradation in Progressively Burned Human Bone and Tissue: Recognition of Techniques for Optimal DNA Sequence Analysis. Research conducted with Ms. Elayne Pope, MA, University of Arkansas and Dr. Frank Cipriano, Director, Conservation Genetics Laboratory, San Francisco State University, San Francisco, CA.

Michelle Kaye

2003: Laboratory research conducted to test the viability of ancient DNA with special concern to past conservation methods. Project conducted with Dr. Steve Gabow and Dr. Niccolo Caldararo from the Anthropology Department, and Dr. Joseph Romeo from the Clinical and Biomedical Laboratory Sciences Department at San Francisco State University, San Francisco, CA.

Special Skills:

- Familiar with mandates, guidelines, and legislation affecting archaeology/cultural resource management, and forensics (esp. ARPA, NEPA, CEQA, NHPA, NAGPRA, California Health and Safety Codes, esp. Divisions 7: Dead Bodies, 8: Cemeteries, and Division 102: Vital Records and Health Statistics).

- Computer skills: Microsoft Word, XP, MS Vista, Corel WordPerfect. Excel, PowerPoint, SPSS, EndNote, Fordisc 3.1, Calib 5.0.1., Sequencher, Paup, BioEdit, BioLign, and ClustalX.

- Administrative skills: data entry, typing, editing, fact-checking, business and scientific writing (generating technical reports, memos, manuscripts, syllabi, summaries, and scientific articles), public relations/journalism, reception, multiple phone lines, public speaking, filing, and excellent written and communication skills.

- Familiar with medical and dental terminology.

- Physical/Forensic Anthropologist. Experience in Osteology, Anatomy, and Dental Anthropology. Supervisory experience.

- Academic and Internet research and evaluation.

- Type 65 wpm.

- Experienced in the preservation and collection of evidence, including chain of custody.

- Proficient in all stages of the analysis of molecular samples (PCR, mtDNA, STRs). Experienced working with a variety of challenging samples, including ancient, degraded, inhibited, burned, and low template DNA. Cloning experience.

- Training completed in Occupational Safety and Health Administration Requirements, including Bloodborne Pathogen Standards, Biosafety Level 2 Training, and Biosafety in Microbiological and Biomedical Laboratories.

- Familiar with the equipment normally used in a morgue, and with orthopaedic surgical instrumentation.

- Proficient in the operation of Philips X-ray/Fluoroscope, Philips Mobile C-Arm, Philips Mobile 3-D C-Arm, and Orthoscan Mini C-Arm. Experience reading X-rays and CT scans.

- Completed FEMA Emergency Management Independent Study courses 100a, 200a, 700a, and 800b.

Professional Memberships:

- American Academy of Forensic Sciences
- Kenyon International Emergency Services, Team Member (under contract)

Michelle Kaye

Languages:

- English (fluent)
- French (reading and basic conversational knowledge)
- Spanish (basic reading knowledge)

Teaching:

- Introduction to Biological Anthropology (Lecture and Laboratory)
- Human Osteology (Lecture and Laboratory)
- Introduction to Cultural Anthropology
- Anatomy Laboratory

References:

Dr. Joel D. Irish, Professor of Biological Anthropology, University of Alaska Fairbanks. Address: University of Alaska Fairbanks, Department of Anthropology, 310 Eielson Building, PO Box 757720, Fairbanks, AK. 99775-7720. Phone: (907) 474-7288 or (907) 474-6755. Email: ffjdi@uaf.edu.

Dr. Jeffrey Boland Fentress, NAGPRA Coordinator, San Francisco State University, Department of Anthropology 1600 Holloway Ave. San Francisco, CA. 94132. Phone: (415)-338-3075 (NAGPRA office), Phone: (415)-338-2046 (Anthropology office), Fax: 415-338-3050. Email: fentress@sfsu.edu.

Dr. Steven A. Symes, Assistant Professor and Forensic Anthropologist, Mercyhurst Archaeological Institute, Mercyhurst College, Erie, PA. Address: Department of Applied Forensic Sciences Mercyhurst Archaeological Institute, Mercyhurst College, 119 Zurn Hall, Erie, PA. 16546 Phone: (814) 824-3369. Email: ssymes@mercyhurst.edu.

Dr. Frank Cipriano, Director Conservation Genetics Laboratory, Biology Department/Hensill Hall, San Francisco State University, 1600 Holloway Avenue, San Francisco CA. 94132. Phone: (415) 338-3453. Fax: (415)338-6245. Email: cipriano@sfsu.edu.

Ms. Sherri Gust, Principal Investigator/Project Manager Cogstone Resource Management, Inc., 1518 West Taft Avenue, Orange, CA. 92685. Phone: (714) 974-8300. Fax: (714) 974-8303. Email: sgust@cogstone.com

Mrs. Angela McArdle, Archaeologist. National Training Center/Fort Irwin. 8726 Anzio St. Fort Irwin, CA. 92310. Phone (910) 638-9777. Email: angela.bleggi@gmail.com

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Appendix D
CONFIDENTIAL Cultural Resources Maps

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End of Appendix C

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APPENDIX D

Fall 2010 Habitat and Listed Species Surveys of NASA-Administered Property at Santa Susana Field Laboratory

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FINAL REPORT

Fall 2010 Habitat and Listed Species Surveys of NASA-Administered Property at Santa Susana Field Laboratory

National Aeronautics and Space Administration
Marshall Space Flight Center
Huntsville, Alabama

February 2011

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Final Report

Fall 2010 Habitat and Listed Species Surveys of NASA-Administered Property at Santa Susana Field Laboratory

National Aeronautics and Space Administration

George C. Marshall Space Flight Center
Huntsville, Alabama

February 2011

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Acronyms

CDFG	California Department of Fish and Game
CNDDB	California Natural Diversity Data Base
CNPS	California Native Plant Society
^{o}F	Fahrenheit
FACW	Facultative Wetland
ft	Feet
msl	Mean Sea Level
NASA	National Aeronautics and Space Administration
NRMP	Natural Resources Management Plan
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
SOI	Species of Interest
SSC	Species of Special Concern
SSFL	Santa Susana Field Laboratory

SECTION 1

Introduction

This report presents the findings of Fall 2010 habitat and listed species surveys conducted on National Aeronautics and Space Administration (NASA)-administered property at Santa Susana Field Laboratory (SSFL), located in southern California. SSFL was established shortly after World War II and has been used primarily as a site to develop and test nuclear reactors, rockets, and missiles. The site is 2,850 acres and is divided into four production and two buffer areas, (Area I, II, III, and IV, and the northern and southern buffer zones). A portion of SSFL is federally-owned property that is administered by NASA. The remaining property at SSFL is owned by the Boeing Company. NASA-administered property at SSFL consists of 40 acres within Area I and all 404 acres of Area II. The Boeing Company owns the remainder of Area I, all of Area III and Area IV, and the northern and southern buffer areas at the site.

The Fall 2010 surveys were conducted to support NASA's preparation of a Natural Resources Management Plan (NRMP) for the property it administers at SSFL. The primary tasks were to characterize/map natural communities; conduct species-specific and general (opportunistic) surveys for listed and special-status species; and develop plant and animal inventories. NASA conducted past ecological surveys on portions of the property it administers at SSFL in April 2008 and May 2009 as part of Resource Conservation and Recovery Act (RCRA) Facility Investigations (RFIs) (CH2MHILL, 2008, 2009, 2009a). The Fall 2010 surveys were intended to expand upon these past ecological surveys through survey of all NASA-administered property at SSFL, including those areas not previously surveyed outside the RFI areas. The findings of the surveys will be incorporated into the SSFL NRMP, which is being prepared by NASA to provide guidance on the management of natural resources on the property it administers at SSFL.

SECTION 2

Location and Environmental Setting

2.1 General

SSFL is located mostly within an unincorporated part of Ventura County, California; its easternmost portion extends slightly into an unincorporated part of Los Angeles County (Figure 1). The site is approximately 7 miles northwest of the community of Canoga Park and approximately 30 miles northwest of downtown Los Angeles. It encompasses 2,850 acres within a remote, mountainous area near the crest of the Simi Hills at the western border of the San Fernando Valley.

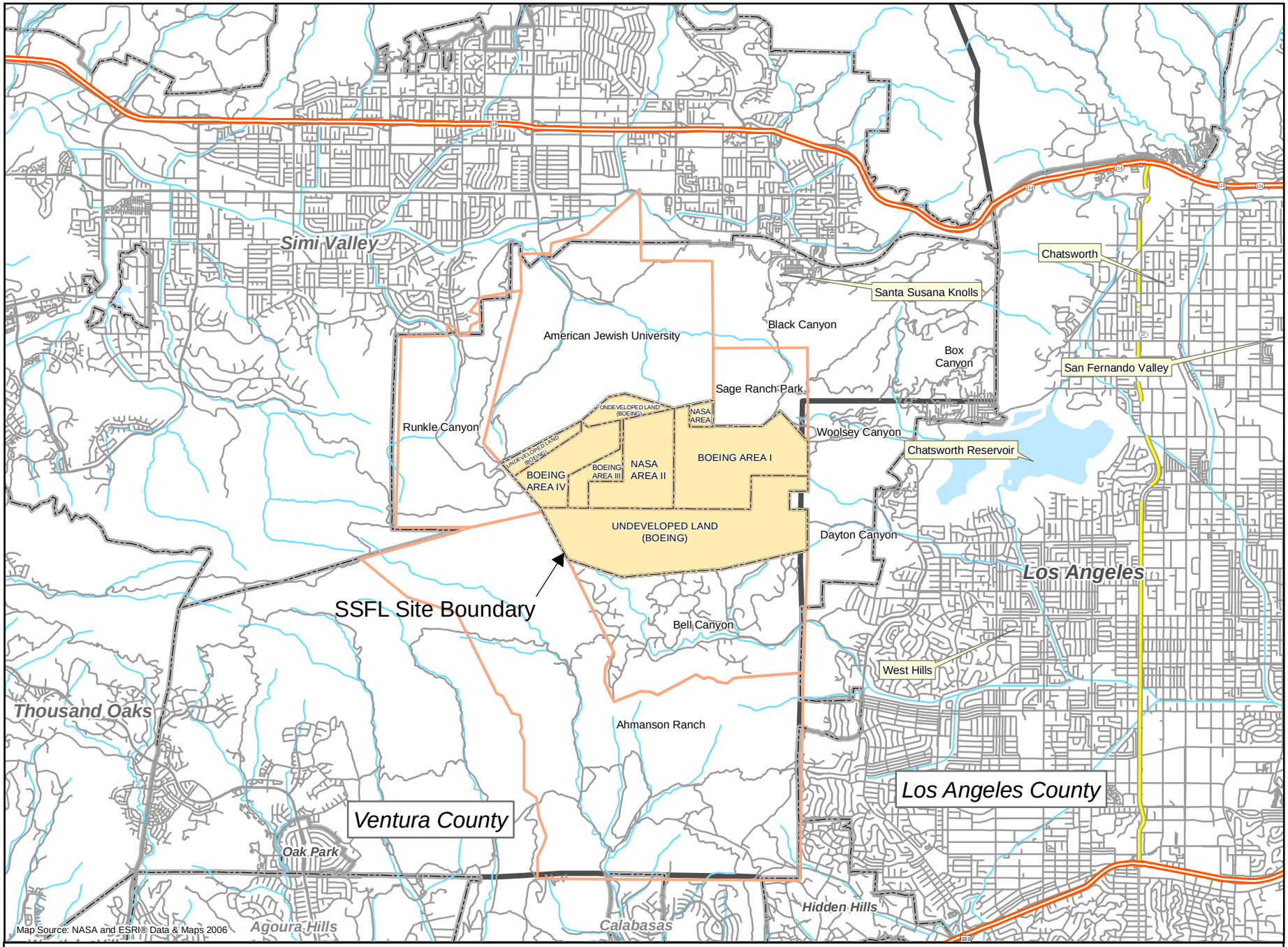
NASA-administered property at SSFL consists of 40 acres within Area I and all 404 acres of Area II (Figure 2). The Boeing Company owns the remainder of Area I, all of Area III and Area IV, and the northern and southern buffer areas at the site. Area II and Area I are located in the central and north-central parts of SSFL, respectively. NASA-administered property at SSFL represents approximately 15.6 percent of the total area of the site.

SSFL's landscape is dominated by sandstone outcropping hills. Numerous industrial facilities, man-made drainage systems, and roadways have been developed within this hilly landscape. The site is located within the central portion of the Southern California Coast ecological subregion in the Simi Valley – Santa Susana Mountains (261Be) ecological subsection (Miles and Goudey 1998). This subsection includes steep mountains, moderately steep to steep hills, and nearly level to gently sloping floodplains, terraces, and alluvial fans. The predominant natural plant communities in the area include California sagebrush series, Mixed sage series, Chamise series, Mixed scrub oak series, and Coast live oak series. There are small areas of California walnut series (Miles and Goudey 1998).

2.2 Physiography

SSFL is located within the Pacific Mountain System, Pacific Border Province, and Los Angeles Ranges (also known as the Transverse Ranges) physiographic region. Generally, the Transverse Ranges represent a complex of tectonic forces resulting from the interaction of the Pacific and the North American plates along the San Andreas Fault. The Transverse Ranges are oriented predominantly east-west and include the Santa Ynez Mountains, San Rafael Mountains, Sierra Madre Mountains, Topatopa Mountains, Santa Susana Mountains, Simi Hills, Santa Monica Mountains, San Gabriel Mountains, Puente Hills, Chino Hills, and San Bernardino Mountains.

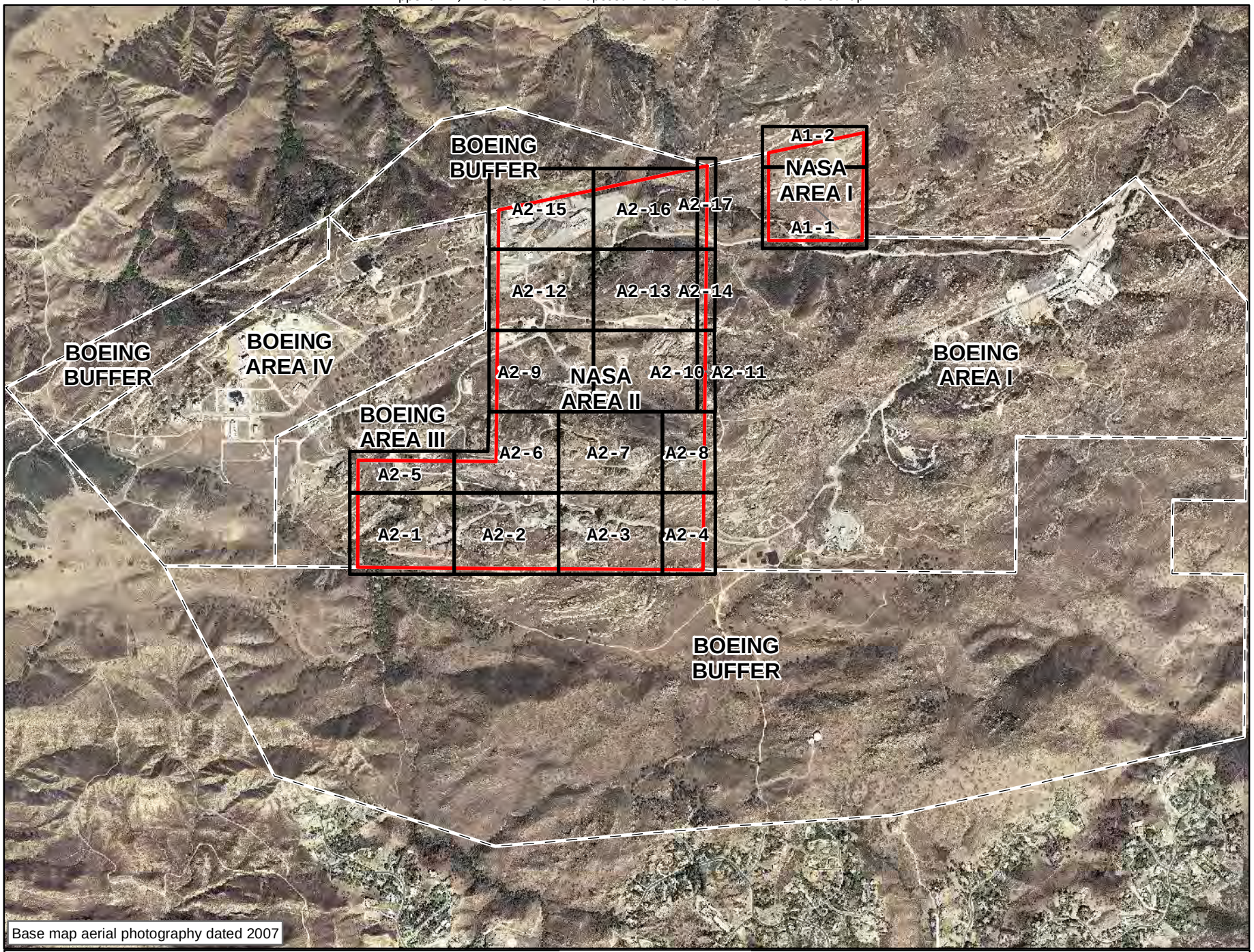
The Transverse Ranges are characterized by extreme differences in geologic age and composition, varying from sedimentary rocks in the western Santa Ynez and Santa Monica Mountains to primarily granitic and metamorphic rock in the eastern regions, where they terminate abruptly in the San Gabriel and San Bernardino Mountains.



3-NOV-2010
Drawn By:
A. Cooley

Figure 1
Regional Map
NASA Habitat Survey - Fall 2010
Santa Susana Field Laboratory
Ventura County, California

Map Document:(O:\NASA\SSFL\maps\SSFL_Regional_8x11.mxd ES012111042614TPA



16-NOV-2010
Drawn By:
A. Cooley

0 750 1,500 3,000 Feet

Legend

- Grid
- NASA Property Boundary
- SSFL Property Boundary

Figure 2
Site Overview
NASA Habitat Survey - Fall 2010
Santa Susana Field Laboratory
Ventura County, California

Map Document:(O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_Site_Overview.mxd)

SSFL consists of hilly terrain that expresses approximately 1,100 feet (ft) of topographic relief. The highest surface elevation at SSFL exists near the center of the site at an approximate elevation of 2,245 ft above mean sea level (msl). The highest surface elevations at SSFL exist in two general bands that strike along a northeast-southwest trend, consistent with the geology of the area. The lowest elevation, which exists at the eastern property boundary, is approximately 1,175 ft above msl. The lower elevations at SSFL exist primarily along the eastern, southern, and north-central to northwestern perimeters of the property.

There are no natural lakes at SSFL. Streams occur within highly fractured breaks between uplifted and eroded rock formations. Small, isolated wetlands may occur in areas where seeps exist or runoff accumulates. Runoff is rapid and all streams are generally dry during summer.

2.3 Geology

SSFL is located in the Transverse Ranges of southern California, which are characterized by north-south compression that has produced geologic structures such as faults, synclines, and anticlines that are elongated in an east-west direction. The primary geologic units at SSFL are the Quaternary Alluvium and the Cretaceous Chatsworth Formation. The Chatsworth is overlain by the Simi Conglomerate Member of the Paleocene Santa Susana Formation in the northern part of the site, and is faulted against the Santa Susana Formation in the western part of the site. To the south, the Chatsworth is overlain by southward dipping late Tertiary formations. Structurally, SSFL is located on the southern flank of an east-west striking and westward plunging syncline that passes through the central part of the Simi Valley. These geologic formations are described below:

Quaternary Alluvium–Alluvial soils are generally thin and typically 5 to 15 ft thick at SSFL. Alluvial soils usually occur in topographic lows and along stream drainages. Disturbed soils also have been used as fill material in developed portions of SSFL. Thick fill soils (up to 35 to 40 ft) have been identified in the northeastern and north-central parts of SSFL. The alluvium generally consists of weathered Chatsworth Formation sediments and is usually a fine-grained silty sand.

Chatsworth Formation–Most of SSFL is underlain by the Cretaceous Chatsworth Formation, which consists of interbedded sandstone and shale. These sediments have been interpreted as deep-sea turbidite deposits. The Chatsworth Formation has been divided into the Lower Chatsworth Formation and the Upper Chatsworth Formation. The Upper Chatsworth Formation has been further subdivided into the Sandstone 1 and Sandstone 2 units.

2.4 Climate and Meteorology

Climate and meteorological data have been collected for SSFL since the 1960s. The climate falls within the Mediterranean sub-classification, and monthly mean temperatures range from 50 degrees Fahrenheit (^{o}F) during the winter months to 70^{o} F during the summer months (SAIC, 1994). During the summer months (April through October), an onshore wind pattern occurs because of the proximity of the adjacent Pacific Ocean; during the winter months, this pattern is interrupted by weather fronts (SAIC, 1994). Wind measurements collected at SSFL in 2003 indicate that the prevailing wind pattern is northwest-southeast (Sonoma Technology, Inc., 2003). This wind rose pattern is consistent with historical data collected in the 1960s and 1990s.

Precipitation at SSFL is normally in the form of rain, although snow occasionally falls during winter. Precipitation at the site has averaged approximately 18 inches per year between 1960 and 2006. During this period, the annual precipitation has ranged from a low of 5.7 inches in 2002 to a maximum of 41.2 inches in 1998. Most of the annual precipitation at SSFL occurs between November and March, which is consistent with the regional precipitation pattern of southern California.

Wildfires are common in the part of California where SSFL is located. A large portion of the SSFL was burned during the Topanga Fire of October 2005. Evidence of this fire was visible in the form of burned tree stumps and shrubs in many of the areas investigated during the Fall 2010 surveys. Crown sprouting was common where fire damage to native perennial vegetation was less severe. Previously burned annual vegetation, such as grasslands and ruderal areas, have been largely replaced with new growth since the 2005 fires.

SECTION 3

Methods

3.1 General

The Fall 2010 habitat and listed species surveys were conducted from September 28 to October 8, 2010 by two experienced CH2M HILL Inc. biologists. The primary tasks were to characterize/map natural communities; conduct species-specific and general (opportunistic) surveys for listed and special-status species; and develop plant and animal inventories on all of NASA-administered property at SSFL accessible by foot.

Natural communities encountered during the surveys were characterized and mapped. The approximate boundaries of each identified natural community were delineated on aerial photographs based on aerial photo-interpretation. Natural communities were characterized based on dominant plant species composition and information on each community was recorded on Natural Community Datasheets. Recorded data included dominant plant species, wildlife observations, and information on the habitat quality of each community. Assessments of habitat quality included identification of obvious impacts to the community, such as physical disturbance (including wildfire), hydrological impairments, and the presence of exotic/invasive species.

The species-specific survey was focused on the Braunton's milk-vetch (*Astragalus brauntonii*), which is a plant species that is federally listed as Endangered. Although this plant had not been sighted on NASA-administered property in the past, it is known to spread in response to wildfires and, therefore, was expected to have potentially recruited onto NASA-administered property following recent fires near SSFL.

General (opportunistic) surveys were conducted for other species that could be identified during the same time the milk-vetch survey was being conducted. The general surveys were designed to focus on those plant and animal species that have been documented to occur, or are expected to potentially occur, within or in the vicinity of SSFL during fall based on previous surveys and other data sources. Based on this approach, the general surveys were focused on the Santa Susana tarplant (*Deinandra minthornii*), which is state listed as Rare; non-chalky (i.e., without a white powdery bloom) species of dudleya (*Dudleya* spp.); and California black walnut (*Juglans californica*), which is not state or federally listed but is considered vulnerable due to overgrazing and habitat loss. Non-chalky species of dudleya were surveyed because they could potentially be listed or special-status species of dudleya, such as the Agoura Hills dudleya (*Dudleya cymosa* ssp. *agourensis*) or Conejo dudleya (*Dudleya parva*), both of which are federally listed as Threatened. Because dudleya species are not in bloom during fall, this approach was used to identify areas within the study area where listed species of dudleya could potentially occur.

In addition to the plant surveys, the general surveys included binocular surveys for raptor nests and surveys for rock basins and depressions that could potentially support listed fairy shrimp species. The rock basin surveys involved searches for basins that have adequate size and structure to potentially hold enough water during the wet season to potentially support fairy shrimp. The surveys did not include sampling of the basins to determine presence or absence of fairy shrimp. The existence of raptor nests on test stands and other man-made structures was assessed only by utilizing binoculars to minimize safety risks to survey

personnel. Survey personnel did not enter or climb onto any man-made structure during the surveys. The locations of targeted species sighted during the species-specific and general surveys were recorded by GPS (where accessible) and on aerial photographs. Information on targeted species identified, such as species description, habitat type, and other relevant observations, was recorded on Species of Interest (SOI) Datasheets.

3.2 Desktop Preparations

Desktop preparations for the field surveys included reviews of published reports on the ecology and habitats of California, including Miles and Goudey (1998), Sawyer et al. (2010), and Holland (1986). This information was used to develop a comprehensive understanding of the primary vegetation and habitat types expected to occur in the study area.

Desktop preparations also included reviews of previous ecological surveys conducted at SSFL (CH2MHILL, 2008, 2009, and 2009a; SAIC, 2009; and MWH, 2007), a search of the California Natural Diversity Data Base (CNDDB), and a review of the California Native Plant Society (CNPS) On-line Inventory of Rare and Endangered Plants (CNPS, 2010). Information from the previous ecological surveys and CNDDB search (CNDDB, 2008) were used to develop a tentative plant list to be used during the field surveys. Representative photographs of many of the species on the tentative plant list were obtained from the internet to facilitate field identification of plant species. The CNDDB occurrence data was rendered into a map that was used as a field aid during the surveys. The CNPS Inventory of Rare and Endangered Plants provided information on the flowering periods of listed and special-status plant species that could occur within the study area.

Ortho-rectified, 150-scale (1 inch = 150 ft) aerial photographs with overlain survey area boundaries were prepared as the base maps for the field surveys. These aerial photograph base maps were generated from the NASA GIS database using the following base datum coordinate system: NAD_1927_StatePlane_California_V_FIPS_0405. Vegetation mapping previously conducted for the entire SSFL site (TAIC, 2002) was also overlain onto the base maps to facilitate natural community characterization and mapping during the field surveys.

3.3 Field Survey Detail

The field surveys were conducted via systematic walking. Due to rugged terrain and impenetrable vegetation in some areas, transects were not used and not all areas were traversed; however, the foot surveys allowed view of most of the study area. The aerial photograph base maps were used in the field to delineate the habitats in the study area. The delineated habitats were subsequently digitized into the NASA GIS database and re-mapped onto the ortho-rectified aerial photograph base maps.

Because the field surveys were conducted during the months of September and October, many of the plants, especially flowering plants and grasses, were senescent, and migratory breeding birds were not present in the study area. The time spent at each site within the study area was limited; therefore, wildlife observations were opportunistic rather than systematic. Direct observations, calls, and signs of wildlife were recorded during the field surveys. Active survey techniques, such as the use of kicknets to identify benthic invertebrates or searches under logs, rocks, and debris for herpetiles were not used due to time constraints.

Field observations were recorded on Natural Community Datasheets and SOI Datasheets. Observations of listed and special-status species and sensitive habitat were also recorded on the aerial photograph base maps. Digital photographs were taken of species of interest and representative natural communities at the locations where corresponding datasheets were completed and the photographs were attached to the corresponding datasheets. Other photographs were taken of relevant site features and representative habitats to provide a visual record of conditions in the study area. The location of each digital photograph was mapped onto the aerial photograph base map. The following information was recorded for each photograph: date, name of the site, general description of the subject, and location of the photograph.

An area known to contain Braunton's milk-vetch is located in the southern part of Boeing Area IV (Figure 1). This species was sighted at this location during 2008 field surveys, so the same location was re-visited to determine the current physical appearance of the species. This reference observation was intended to calibrate the search image for this species on NASA-administered property during the Fall 2010 surveys. Known locations of Santa Susana tarplant at the ELV Site on NASA-administered property were also visited to inspect the current appearance of this species.

Locations of Santa Susana tarplants were recorded by taking a GPS point for each tarplant wherever they could be accessed. In cases where plants were small and tightly clustered, a single GPS point could represent one to five plants. Tarplants that could not be safely reached by foot were identified and counted using binoculars. These locations were pin-pricked on the base maps and their coordinates were later determined using GoogleTM Earth. In some areas, buildings and rock walls interfered with the GPS signal and limited satellite reception. Therefore, the GPS data collected for tarplants and other species/features has variable accuracy and all GPS locations should be considered approximate.

Locations of non-chalky dudleya and California black walnut were recorded by GPS. Because the dudleya plants were small and outside of their flowering period (senescent), a comprehensive survey of listed and special-status species of dudleya within the study area was not conducted. The GPS points taken of dudleya locations represent areas and habitats where listed and special-status species of dudleya could potentially occur within the study area.

GPS points were taken of rock basins that could potentially support fairy shrimp. However, given the range in size and continuity of rock basins within the study area, it is likely that all potentially suitable rock basins were not identified during the survey.

Voucher samples of plants that could not be identified in the field were collected in Ziploc bags for later identification using local taxonomic keys. The voucher plants were integrated with the field-identified plants for the study; however, it should be noted that many annual plants had senesced to a point that did not allow identification.

SECTION 4

Results

4.1 Habitat Characterization and Mapping

A variety of habitat types were characterized and mapped during the Fall 2010 surveys. Information on the habitat types identified during the surveys is presented in Table 1 and the habitat mapping is shown on the figures in Appendix A (Appendix A figures are based on the grid on Figure 2 and labels in Table 1). The Natural Community Datasheets with corresponding photographs completed for representative habitat types are provided in Appendix B.

Because most of the annual plants were in a state of senescence and not readily identifiable, a comprehensive inventory of plant species for the study area could not be developed during the Fall 2010 surveys. A list of plant species sighted during ecological surveys conducted as part of RFIs in April 2008 and May 2009 is provided as Appendix C. During the Fall 2010 surveys, the survey team sighted many of the same species identified during the April 2008 and May 2009 surveys, as well as four additional species not previously identified. These additional species are included in the plant list in Appendix C.

4.1.1 Natural Habitats

4.1.1.1 Baccharis Scrub

Baccharis scrub consists mostly of shrub vegetation that is dominated by coyote brush (*Baccharis pilularis*). The coverage of this habitat type on NASA-administered property at SSFL is relatively limited (2.62 total acres). Other designations for this habitat type include northern coyote brush scrub (CNDDB 1990), *Baccharis pilularis s*hrubland alliance, and coyote brush scrub (Sawyer et al. 2009). This habitat typically occurs in areas that are windy and exposed with shallow rocky soils (Holland 1986) and is often found on the sides of streams or on terraces (Sawyer et al. 2009). A photograph taken of this habitat type during the surveys is provided as Photo 1 in Appendix D.

Within the study area, coyote brush can be relatively dense and can occur in nearly pure stands, which is the case in the eastern part of the Bravo Site (Appendix A Figures A2- 9 and A2-10) and on the western and northern sides of the B515 STP Site (Appendix A Figure A2-12), or it can be relatively sparse, which is the case in the disturbed HWSA Site (Appendix A Figure A2-9).

4.1.1.2 Chaparral

Chaparral is the dominant habitat type on NASA-administered property at SSFL (172.63 total acres). This habitat type includes northern and southern mixed chaparral (CNDDB 1990). It is generally associated with dry, rocky, often steep slopes with little soil. Within the study area, chaparral is dominated by chamise (*Adenostoma fasciculatum*), thickleaf yerba santa (*Eriodictyon crassifolia*), and laurel sumac (*Malosma laurina*) with numerous interspersed sage (*Salvia* spp.) and other species. Poison oak (*Toxicodendron diversilobum*) in this habitat is primarily associated with dense vegetation along drainages. Information collected on a representative of this habitat type during the surveys is documented on Natural Community Datasheet D-CHP801 in Appendix B.

TABLE 1
Habitat Types Identified on NASA-Administered Property at SSFL During Fall 2010 Surveys

Label	Description[1] Total Acreage	CNDDB Natural Community Designation[2]
Natural Habitats		
BS	Baccharis Scrub 2.62 acres	32110 Northern Coyote Brush Scrub
CHP	Chaparral 172.63 acres	37110 Northern Mixed Chaparral 37120 Southern Mixed Chaparral
CLORF	Coast Live Oak Riparian Forest 9.16 acres	61300 Southern Coast Live Oak Riparian Forest
CLOW or CLO[3]	Coast Live Oak Woodland 13.22 acres	71160 Coast Live Oak Woodland
FWM	Freshwater Marsh 0.17 acres	52410 Coastal and Valley FWM
MFS	Mulefat Scrub 2.09 acres	63310 Mulefat Scrub
NNG	Non-native Grassland 18.62 acres	42200 Non-Native Grassland
SS	Venturan Coastal Sage Scrub 64.44 acres	32300 Venturan Coastal Sage Scrub
SWS	Southern Willow Scrub 1.04 acres	63320 Southern Willow Scrub
WET	Undifferentiated Wetland 0.57 acres	NA
Non-Natural Habitats		
DEV	Developed 58.10 acres	NA
OW	Open Water 0.41 acres	NA
RH	Ruderal 16.75 acres	NA

NOTES:

[1] Vegetation classifications based on Holland (1986).

[2] California Natural Diversity Data Base (CNDDB) Natural Communities, November 1990.

[3] CLO label used for free standing or small clusters of oak trees.

NA – Not Applicable. No corresponding designation in Holland (1986) for this type.

When multiple habitats occur in a mosaic within the mapping unit, the dominant habitat type (based on proportion of cover) is listed first. Estimated acreages are based on the dominant habitat type.

Total area of all mapped habitat types is 444.3 acres.

Habitat Unit Modifiers on Appendix A Figures:

RO - Rock Outcrop area. May occur by itself or is co-located with other vegetation types. Total rock outcrop area with no significant co-located habitat type is 84.47 acres.

D – Disturbed, either due to previous clearing or wildlife.

Northern mixed chaparral typically consists of tall (6.5 to 13 ft), dense to nearly impenetrable vegetation on north-facing slopes in southern California (Holland 1986). Within the study area, this habitat type was identified in the vicinity of the LOX Site in Area I (Appendix A Figure A1-1); north of the Area II Landfill (Appendix A Figure A2-17); south of the roadway between the Area II Landfill and Alfa Site (Appendix A Figures A2-13, A2-14, and A2-17); and north of Skyline Road in Area II (Appendix A Figures A2-6, A2-7, and A2-8).

Most of the chaparral on NASA-administered property at SSFL is southern mixed chaparral, which is similar in species composition to northern mixed chaparral but is typically not as dense or tall (5 to 10 ft). Southern mixed chaparral has occasional patches of bare soil or forms a mosaic with Venturan coastal sage scrub (Holland 1986). These habitats were identified on slopes of various aspects within the study area.

4.1.1.3 Coast Live Oak Riparian Forest

Coast live oak riparian forest is limited to the largest canyons and drainages on NASA-administered property at SSFL (9.16 total acres). Mature coast live oak (*Quercus agrifolia*) is the dominant canopy species in this habitat type. The ground cover in this habitat is typically dominated by various grasses and mugwort (*Artemesia douglasiana*). The shrub layer is typically poorly developed (Holland 1986); however, poison oak was common near drainage channels in this habitat in the study area. A photograph taken of this habitat type during the surveys is provided as Photo 2 in Appendix D.

Another designation for coast live oak riparian forest (as well as for coast live oak woodland described below) is *Quercus agrifolia* woodland alliance (Sawyer et al. 2009). This habitat type is associated with alluvial terraces, canyon bottoms, stream banks, slopes and flats with deep sandy or loamy soils with high organic matter. Because of its thick bark, coast live oak is exceptionally resistant to periodic wildfires.

Within the study area, coast live oak riparian forest was identified in the drainage south and west of the LOX Site (Appendix A Figure A1-1); in the drainages southwest of the R-2 Ponds and north of the Delta Site (Appendix A Figures A2-1 and A2-2); in the drainage west of the CDFF Site (Appendix A Figure A2-5); along the roadway northwest of the Bravo Site (Appendix A Figure A2-9); and west and northwest of the Area II Landfill (Appendix A Figures A2-16 and A2-17).

4.1.1.4 Coast Live Oak Woodland

Coast live oak woodland is a relatively widespread, although not extensive, habitat type on NASA-administered property at SSFL (13.22 total acres). It occurs in areas not associated with a canyon or major drainage where mature coast live oak is the dominant canopy species. This habitat type also includes individual or small groups of trees that are probably remnants of formally more extensive oak woodlands or riparian forests. It typically occurs on north-facing slopes in southern California (Holland 1986). Information collected on a representative of this habitat type during the surveys is documented on Natural Community Datasheet CLOW801 in Appendix B. A photograph taken of this habitat type during the surveys is provided as Photo 3 in Appendix D.

As with coast live oak riparian forest, the shrub layer in coast live oak woodland is poorly developed. Within the study area, the shrub layer, where present, included blue elderberry (*Sambucus mexicana*) and poison oak. The herbaceous layer was dominated by various grasses such as wild oats (*Avena fatua*) and ripgut brome (*Bromus diandrus*), and by weedy

species such as milk thistle (*Silybum marianum*), Italian thistle (*Carduus pycnocephalus*), and cobweb thistle (*Cirsium occidentale*).

Within the study area, coast live oak woodland was identified in the drainage south and west of the LOX Site (Appendix A Figure A1-1); in the large meadow southwest of the Delta Site (Appendix A Figure A2-1); west and northwest of the Bravo Site (Appendix A Figure A2-9); and north and northeast of the ELV Site (Appendix A Figures A2-15 and A2-16). Individual and small clusters of coast live oaks exist throughout the study area.

4.1.1.5 Freshwater Marsh

Freshwater marsh habitat on NASA-administered property at SSFL is associated only with artificial stormwater detention basins that have been constructed along natural drainageways (0.17 total acres). Emergent wetland vegetation has developed within these basins with cattail (*Typha latifolia*) being the dominant plant species. Freshwater marsh typically exists in the wettest portions of the basins adjacent to the open water habitat. Slightly drier margins of the ponds are dominated by common reed (*Phragmites australis*). The adjacent upland banks of these basins are covered mostly by willow trees and shrubs (*Salix* spp.). Freshwater marshes lack significant current and are permanently flooded by fresh water rather than water that is brackish, alkaline, or variable (Holland 1986).

Information collected on a representative of this habitat type during the surveys is documented on Natural Community Datasheet FWM-OW01 in Appendix B. Within the study area, freshwater marsh was identified around the R-2 Ponds (Appendix A Figures A2-1 and A2-5) and the detention basin north of the Coca Site (Appendix A Figure A2-2).

4.1.1.6 Mulefat Scrub

Mulefat scrub is a relatively limited habitat type on NASA-administered property at SSFL (2.09 total acres). Mulefat scrub consists of mostly of shrub vegetation that is dominated by mulefat (*Baccharis salicifolia*). Other designations for this habitat type include *Baccharis salicifolias s*hrubland alliance and mulefat thickets (Sawyer et al. 2009). This habitat type is typically associated with intermittent stream channels with fairly coarse-textured soils, and is maintained by frequent flooding (Holland 1986). Mulefat scrub occurs in canyon bottoms, floodplains, irrigation ditches, lake margins, and stream channels. Mulefat is designated as a "Facultative Wetland" (FACW) plant species by the U.S. Fish and Wildlife Service. The FACW designation indicates that the species usually occurs in wetlands (67 – 99 percent probability), and occasionally occurs in non wetlands.

Within the study area, mulefat scrub was identified around the R2-Ponds (Appendix A Figures A2-1 and A2-5); north and northeast of the Coca Site (Appendix A Figures A2-3 and A2-4); on the northeastern side of the Bravo Site (Appendix A Figure A2- 9 and A2-10); north of the LOX Site (Appendix A Figure A1-1); and south of the ELV parking lot (Appendix A Figure A2-16).

4.1.1.7 Non-native Grassland

Non-native grassland is a relatively widespread habitat type on NASA-administered property at SSFL (18.62 total acres). This habitat type is characterized by dense to sparse cover of annual grasses that are between 0.6 and 3.3 ft in height. The grass cover is often associated with numerous species of native annual forbs (i.e., showy wildflowers) especially in years of favorable rainfall. With a few exceptions, the plants in this habitat are dead through the summer-fall dry season (Holland 1986). Information collected on a

representative of this habitat type during the surveys is documented on Natural Community Datasheets NNG801 and RO-NNG in Appendix B. Photographs taken of this habitat type during the surveys are provided as Photos 4 through 7 in Appendix D.

Within the study area, the grasses in this habitat type consist of slender oat (*Avena barbata*), wild oat, red brome (*Bromus madritensis* spp. *rubens*), ripgut brome, and wild rye (*Lolium multiflorum*). Non-native grassland occurs throughout the study area in a mosaic with chaparral, sage scrub, and rock outcrops (Appendix D Photo 4). This habitat type is also associated with dove weed (*Eremocarpus setigerus*) and telegraph weed (*Heterotheca grandiflora*) (Appendix D Photo 5) and occurs in patches on eroded rock outcrop slopes (Appendix D Photo 6).

Within the study area, large, nearly pure grasslands were identified in the southwestern portion of Area II (Appendix A Figure A2-1) and within undisturbed ravines between uplifted rock outcrops (Appendix A Figures A2-1, A2-4, A2-6, A2-7, A2-8, A2-10, A2-11, and A2-13). This habitat type also occurs within or adjacent to coast live oak woodland (Appendix D Photo 7), such as in the area between the ELV Site and Alfa Site (Appendix A Figure A2-13).

4.1.1.8 Venturan Coastal Sage Scrub

Venturan coastal sage scrub is a relatively widespread habitat type on NASA-administered property at SSFL (64.44 total acres). This habitat type is characterized by lower (1.6 to 6.6 ft) and less dense vegetation than that which exists in chaparral habitat. Most of the flowering in this habitat type occurs during spring and early summer and the plants are mostly dormant during late summer through early fall. This habitat type often occurs on dry, rocky slopes and many of the plant species are adapted to fire via crown sprouting (Holland 1986). Information collected on a representative of this habitat type during the surveys is documented on Natural Community Datasheet D-SS01 in Appendix B. Photographs taken of this habitat type during the surveys are provided as Photos 8 through 10 in Appendix D.

Within the study area, Venturan coastal sage scrub consists of thickleaf yerba santa, California buckwheat (*Eriogonum fasculatum*), deer weed (*Acmispon glaber*), purple sage (*Salvia leucophylla)*, black sage (*Salvia mellifera)*, and chaparral yucca (*Yucca whipplei*). This habitat type was identified throughout the undeveloped portions of the study area, often in a mosaic with chaparral and rock outcrops (Appendix D Photo 10). Some of this habitat was observed to be disturbed by wildfire or by clearing where adjacent to developed areas. The largest areas of non-disturbed habitat within the study area was found in the southwestern portion of Area II (Appendix A Figure A2-1); near the ABFF Site (Appendix A Figure A2-12); north of the Alfa Site (Appendix A Figures A2-13 and A2-14); and east of the ELV Site parking lot (Appendix A Figure A2-16). In areas where past fires had completely removed the vegetation, some of the re-growth was dominated by deer weed. An example of this case was observed near the detention pond at the Coca Site (Appendix D Photo 8).

4.1.1.9 Southern Willow Scrub

Southern willow scrub is a relatively limited habitat type on NASA-administered property at SSFL (1.04 total acres). It is a wetland habitat that is associated with drainages and more permanent water sources. Photographs taken of this habitat type during the surveys are provided as Photos 11 and 12 in Appendix D.

Within the study area, arroyo willow (*Salix lasiolepis*) is the most common willow species within this habitat type; however, red willow (*Salix laevigata*) and narrow-leaved willow

(*Salix exigua*) also occur in some areas. Small areas of southern willow scrub were identified in the drainage north of the Area II Landfill (Appendix A Figure A2-17); in the drainage north of the Coca Site (Appendix A Figure A2-3); around the R-2 Ponds (Appendix A Figures A2-1 and A2-5); and around the Coca Site detention pond (Appendix A Figure A2-2; Appendix D Photo 12). The largest area of southern willow scrub within the study area was identified in the drainage on the southern side of the Alfa Site (Appendix A Figures A2-10, A2-13, and A2-14).

4.1.1.10 Undifferentiated Wetland

Undifferentiated wetland habitat is a limited habitat type on NASA-administered property at SSFL (0.57 total acres). Within the study area, this habitat type occurs in small areas where restricted drainage traps and ponds water for long enough periods to support wetland vegetation. Most of the wetlands within the study area hold water seasonally and are usually dry during fall and winter. Within the study area, common reed is the dominant wetland plant species in this habitat type. Photographs taken of this habitat type during the surveys are provided as Photos 13, 14, and 15 in Appendix D. Undifferentiated wetland habitat was identified in six areas within the study area (Appendix A Figures A1-2, A2-2, A2-13, and A2-14).

4.1.2 Non-Natural Habitats

4.1.2.1 Developed

Developed areas on NASA-administered property at SSFL consist of buildings, paved roadways, parking areas, and other development. This category also includes unpaved (dirt or gravel) roadways in more remote areas of the site. Developed areas total 58.10 acres on NASA-administered property at SSFL.

In some cases, long disused facilities, such as old roadways or parking areas, have reverted to disturbed natural communities with varying amounts of vegetation cover. Examples of these areas include the roadways northwest of the Coca Site (Appendix A Figure A2-6) and the old parking area southwest of the ELV Site (Appendix A Figure A2-12).

4.1.2.2 Open Water

Open water habitat on NASA-administered property at SSFL is restricted to two stormwater detention basins: the R-2 Ponds (Appendix A Figures A2-1 and A2-5) and the detention basin west of the Coca Site (Appendix A Figure A2-2). There are 0.41 total acres of open water habitat within study area. Photographs taken of this habitat type during the surveys are provided as Photos 16 and 17 in Appendix D.

4.1.2.3 Ruderal

Ruderal habitats are areas with varying amounts of vegetation cover that have experienced man-made disturbance. Within the study area, this habitat type is dominated by weedy and invasive plant species that include red-stem filaree (*Erodium cicutarium*), mustard (*Brassica* spp.), deer weed, and telegraph weed. Ruderal areas total 16.75 acres on NASA-administered property at SSFL. Information collected on a representative of this habitat type during the surveys is documented on Natural Community Datasheet RH801 in Appendix B. A photograph taken of this habitat type during the surveys is provided as Photo 18 in Appendix D.

Examples of large areas of ruderal habitat identified within the study area include previously cleared or restored (capped) areas that have re-vegetated such as the LOX Site (Appendix A Figure A1-1; Appendix D Photo 18); the cap near the R-2 Ponds (Appendix A Figures A2-1 and A2-5); the cap north of the Bravo Site (Appendix A Figure A2-9); and the areas south of the roadway in the vicinity of the Alfa Site (Appendix A Figure A2-13). Numerous small areas of ruderal habitat exist throughout the study area along roadways where herbicide spraying is conducted, or near existing buildings and other development.

4.2 Listed and Special-Status Species Surveys

4.2.1 Plant Species

Braunton's milk-vetch and Santa Susana tarplant are the only two listed/special-status plant species documented by the CNDDB in the vicinity of the study area (Appendix E Figure E-1). Braunton's milk vetch is federally listed as Endangered and the Santa Susana tarplant is state listed as Rare. The other documented plant species occurrences in the vicinity of the study area shown on the CNDDB map are of species that are neither listed nor have special status.

As discussed in Section 3.3, an area in the southern part of Boeing Area IV known to contain Braunton's milk-vetch was visited prior to the Fall 2010 surveys to determine the physical appearance of this species at the time. The Braunton's milk-vetch occurrence location shown on the CNDDB map does not correspond with the known location for this species in Boeing Area IV. The occurrence location is shown on the CNDDB map to be in NASA Area II. It is possible that the documented occurrence is the same as the known location in Boeing Area IV because occurrence locations on the CNDDB map have a spatial accuracy variability of one-mile radius.

All inspected specimens of Braunton's milk vetch in Boeing Area IV were in a state of senescence (Appendix D Photo 19). Nearly all the leaves had fallen off of the plants; the few leaves remaining on the stems were dried and curled. The stems, which were dry and grey, were either intact and approximately 2 or 3 ft in height or were broken and shorter (approximately 1 ft in height). No specimens of Braunton's milk-vetch were sighted in the general area of the CNDDB occurrence location or anywhere else on NASA-administered property at SSFL during the Fall 2010 surveys.

Based on inspections of Santa Susana tarplants at a known location at the ELV Site on NASA-administered property, all specimens were observed to be in bloom (Appendix D Photo 20). Santa Susana tarplants were sighted in 3,657 locations within the study area. Of these locations, only 324 were found in Area II, all of which were on the sandstone outcrops north of the LOX Site (Appendix F Figures A1-01 and A1-02). The overwhelming majority of the Santa Susana tarplants (3,333 locations or 91 percent of the total) were sighted in Area II, where they were widespread throughout the area in association with sandstone outcrop habitat (Appendix F Figures A2-01 through A2-17). Information collected on two of the Santa Susana tarplant locations is documented on SOI Datasheets ST01 and ST14 in Appendix G.

As discussed in Section 3, the dudleya surveys focused on non-chalky species of dudleya because non-chalky specimens could potentially be listed or special-status species. Photographs of non-chalky and chalky specimens of dudleya are provided as Photos 21 and 22, respectively in Appendix D. Because the dudleya plants are not in bloom during fall, a comprehensive survey of listed and special-status species of dudleya within the study area

was not conducted. The GPS points taken of dudleya locations represent areas and habitats where listed and special-status species of dudleya could potentially occur within the study area. A spring dudleya survey is recommended to provide a more comprehensive assessment of listed and special-status species of dudleya within the study area.

Non-chalky dudleya plants were sighted in 30 locations within the study area, all of which were in Area II (Appendix E Figure E-2). The plants were almost exclusively associated with remnant patches of grasses located on north-facing sandstone slopes (Appendix D Photos 23 and 24), such as the grass patches on the northern and southern sides of Skyline Road and on the slopes south of the Coca and Delta Sites (Appendix E Figure E-2). These small patches of grass are believed to be remnants of more extensive grass cover on these slopes that has been disturbed by human activity and has subsequently eroded. An alternative, but less likely, theory is that these patches of grass have established within pockets of accumulated sediment (colluvium) within cracks and microtopographic basins on the sandstone slope surface. Information collected on one of the dudleya locations is documented on SOI Datasheet Dud801in Appendix G.

Three individual California black walnut trees were sighted within the study area. Two of the walnut trees were co-located near the Bravo Site and one tree was located within a narrow canyon on the northern side of Skyline Road (Appendix E Figure E-2).

4.2.2 Animal Species

No listed or special-status wildlife species occurrences are documented by the CNDDB within or in the immediate vicinity of the study area or SSFL (Appendix E Figure E-1). Three California Department of Fish and Game (CDFG) Species of Special Concern (SSC) occurrences are documented by the CNDDB within the general vicinity of SSFL: western spadefoot toad (*Spea hammondii*), arroyo toad (*Anaxyrus californicus*), San Diego desert woodrat (*Neotoma lepida intermedia*), tricolored blackbird (*Agelaius tricolor*), and western mastiff bat (*Eumops perotis californicus*). The arroyo toad is also federally listed as Endangered. No evidence was found during the surveys indicating the potential occurrence of any of these species except for potentially the San Diego desert woodrat. Evidence of potential occurrence of woodrat species was found during the surveys; however, the species of woodrats in the study area could not be identified because no species-specific surveys were conducted.

One SSC reptile species, one SSC bird species, and one fully protected mammal species were sighted, and one federally Endangered butterfly species was potentially sighted, within the study area during the surveys. No occurrences of these species within the vicinity of SSFL are documented by the CNDDB.

The SSC reptile species sighted within the study area was the coast horned lizard (*Phrynosoma coronatum* (*blainvillii* population). Two individuals of this species were sighted, one in ruderal habitat on the Area II Landfill (Appendix E Figure E-3) and one in rock outcrop habitat north of the LOX Site in Area I (Appendix E Figure E-4). Both lizards were juveniles; one was approximately 1.5 inches in length and the other was approximately 1 inch in length. Information collected on these sightings is documented on SOI Datasheets HL01 and HL02 in Appendix G.

The SSC bird species sighted within the study area was the loggerhead shrike (*Lanius ludovicianus*). One individual loggerhead shrike was sighted flying across the road toward the eastern side of the SPA Site in Area II (Appendix E Figure E-3).

The fully protected mammal species sighted within the study area was the ring-tailed cat (*Bassariscus astutus*). One individual ring-tailed cat was sighted on a rock outcrop near a riparian drainage northwest of the SPA Site (Appendix E Figure E-3). The "fully protected" classification was the State of California's initial effort to identify and provide additional protection to those animals that were rare or faced possible extinction. Species that have this classification cannot be taken or possessed at any time.

The Quino checkerspot butterfly (*Euphydryas editha quino*), which is federally listed as Endangered, was potentially sighted within the study area. One individual butterfly that may have been this species was sighted southwest of the Bravo Site in mosaic habitat consisting of rock outcrop, non-native grassland, and Venturan coastal sage scrub (Appendix E Figure E-2). The butterfly was observed in flight and a positive identification was not possible. It was rust/orange colored and had white markings on its wings. The butterfly did not land long enough for a positive identification or photograph. It flew away in a zig-zag pattern similar to that described for male Quino checkerspot butterflies. Information collected on this sighting is documented on SOI Datasheet QCB01 in Appendix G.

4.3 Wildlife Observations

Observations of wildlife within the study were recorded during the Fall 2010 surveys. The animal species identified within the study area via sightings, calls, and other evidence of occurrence are listed in Table 2. As indicated in Table 2, 7 herpetile (reptiles and amphibians) species, 51 bird species, and 10 mammal species were identified during the surveys. Some animal species may not occur within the study area during fall, such as certain migratory bird species; therefore, a spring wildlife survey is recommended to provide a more comprehensive inventory of wildlife within the study area.

Signs of occurrence of the California mule deer (*Odocoileus hemionus californicus*) (Appendix D Photo 25) and wild pig (*Sus scrofa*), and of their predators, such as the mountain lion (*Felis concolor*) and bobcat (*Felis rufus*), were found throughout the study area. The types of wildlife that are supported by the various habitats within the study area can be assessed based on the field observations made during the surveys. It is important to note that the ecotones between the habitats are important to wildlife, especially for foraging, and the majority of animal species are not restricted to the habitat type that they may be most associated with.

Grasslands and some ruderal habitats within the study area support a variety of small mammals and provide important foraging and nesting habitat for raptors and other birds. Birds that forage in grasslands include the red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), and loggerhead shrike (*Lanius ludovicianus*). Ground nesting birds utilize grasslands and to a certain extent, ruderal habitats, including the western meadowlark (*Sturnella neglecta*), horned lark (*Eremophila alpestris*), and savannah sparrow (*Passerculus sandwichensis*). Graveled areas associated with ruderal habitats can provide ground nesting opportunities for species such as the killdeer (*Charadrius vociferus*). Ruderal vegetation occurring within and along the margins of disturbed areas are often utilized by birds such as the American goldfinch (*Carduelis tristis*), house finch (*Carpodacus mexicanus*), and Brewer's blackbird (*Euphagus cyanocephalus*). Mammal species that occur in grasslands and ruderal habitats include the cottontail rabbit (*Sylvilagus* sp.), California ground squirrel (*Spermophilus beecheyi*), and Botta's pocket gopher (*Thomomys bottae*). Rodent burrows in these habitats provide essential upland refuge sites for certain amphibians and reptiles,

including the western toad (*Anaxyrus boreas*) and western fence lizard (*Sceloporus occidentalis*).

TABLE 2
Animal Species Sighted on NASA-Administered Property at SSFL During Fall 2010 Surveys

Common Name	Scientific Name
Herpetiles	
Western Toad	*Anaxyrus* [*Bufo*] *boreas*
Coast Horned Lizard	*Phrynosoma blainvillii*
Western Fence Lizard	*Sceloporus occidentalis*
California Whiptail	*Aspidoscelis tigris munda*
Mountain Gartersnake	*Thamnophis elegans elegans*
Ring-necked Snake	*Diadophis punctatus*
Western Rattlesnake	*Crotalus oreganus helleri*
Birds	
Mallard	*Anas platyrhynchos*
California Quail	*Callipepla californica*
Great Blue Heron	*Ardea herodias*
Green Heron	*Butorides virescens*
Turkey Vulture	*Cathartes aura*
Cooper's Hawk	*Accipiter cooperii*
Red-shouldered Hawk	*Buteo lineatus*
Red-tailed Hawk	*Buteo jamaicensis*
American Kestrel	*Falco sparverius*
Rock Pigeon	*Columba livia*
Band-tailed Pigeon	*Patagioenas fasciata*
Mourning Dove	*Zenaida macroura*
White-throated Swift	*Aeronautes saxatalis*
Black-chinned Hummingbird	*Archilochus alexandri*
Anna's Hummingbird	*Calypte anna*
Rufous/Allen's Hummingbird	*Selasphorus rufus/sasin*
Belted Kingfisher	*Megaceryle alcyon*
Acorn Woodpecker	*Melanerpes formicivorus*
Nuttall's Woodpecker	*Picoides nuttallii*
Northern Flicker	*Colaptes auratus*
Black Phoebe	*Sayornis nigricans*

TABLE 2
Animal Species Sighted on NASA-Administered Property at SSFL During Fall 2010 Surveys

Common Name	Scientific Name
Say's Phoebe	*Sayornis saya*
Loggerhead Shrike	*Lanius ludovicianus*
Cassin's Vireo	*Vireo cassinii*
Western Scrub-Jay	*Aphelocoma californica*
American Crow	*Corvus brachyrhynchos*
Common Raven	*Corvus corax*
Oak Titmouse	*Baeolophus inornatus*
Bushtit	*Psaltriparus minimus*
White-breasted Nuthatch	*Sitta carolinensis*
Pygmy Nuthatch	*Sitta pygmaea*
Rock Wren	*Salpinctes obsoletus*
Canyon Wren	*Catherpes mexicanus*
Bewick's Wren	*Thryomanes bewickii*
House Wren	*Troglodytes aedon*
Wrentit	*Chamaea fasciata*
Northern Mockingbird	*Mimus polyglottos*
California Thrasher	*Toxostoma redivivum*
Orange-crowned Warbler	*Vermivora celata*
Yellow-rumped Warbler	*Dendroica coronata*
MacGillivray's Warbler	*Oporornis tolmiei*
Wilson's Warbler	*Wilsonia pusilla*
Spotted Towhee	*Pipilo maculatus*
California Towhee	*Melzone crissalis*
Rufous-crowned Sparrow	*Aimophila ruficeps*
Lark Sparrow	*Chondestes grammacus*
Fox Sparrow	*Passerella iliaca*
Lincoln's Sparrow	*Melospiza lincolnii*
White-crowned Sparrow	*Zonotrichia leucophrys*
House Finch	*Carpodacus mexicanus*
American Goldfinch	*Spinus tristis*
Mammals	
Desert Cottontail	*Sylvilagus audubonii*

TABLE 2
Animal Species Sighted on NASA-Administered Property at SSFL During Fall 2010 Surveys

Common Name	Scientific Name
California Ground Squirrel	*Spermophilus beecheyi*
Ring-tail cat	*Bassariscus astutus*
Raccoon	*Procyon lotor*
Coyote	*Canis latrans*
Bobcat	*Felis rufus*
Mountain lion	*Felis concolor*
California Mule Deer	*Odocoileus hemionus californicus*
Wild Pig	*Sus scrofa*
Vole species	*Microtus* sp.

Wooded areas within the study area provide foraging, nesting, and shelter habitat for many bird and mammal species. Birds that occur in wooded areas include the Cooper's hawk (*Accipiter cooperii*), oak titmouse (*Baeolophus inornatus*), nuthatches (*Sitta* spp.), and woodpeckers. A variety of warbler and vireo species are also expected to occur in the woodlands within the study area during the breeding season. Mammals, including various rodent species (e.g., *Peromyscus* spp., *Perognathus* spp., and *Mus musculus*), fox (e.g., *Urocyon cinereoargenteus* and *Vulpes* sp.), mule deer, and bobcat use the woodlands within the study area for foraging and denning.

Rock outcrops within the study area serve as breeding habitat for a variety of birds and mammals, and also provide cover for small mammals, reptiles, and amphibians. Rock outcrops can serve as nesting habitat for raptor species including the red-tailed hawk, for owls including the barn owl (*Tyto alba*), and for other birds such as the rock wren (*Salpinctes obsoletus*). Rock outcrops also provide cover and nesting habitat for small mammals including the cottontail rabbit and California ground squirrel, and for reptiles including the California whiptail (*Aspidoscelis tigris munda*) and western rattlesnake (*Crotalus oreganus heller)* (Appendix D Photo 26). Reptiles and small mammals attracted to rock outcrops provide prey opportunities for larger mammals including the coyote (*Canis latrans*), bobcat, and foxes, and for raptors.

Basins and depressions on rock outcrops that are inundated during the wet season could potentially support listed fairy shrimp species. Based on available information, several listed fairy shrimp species are considered to have the potential to occur in seasonally inundated pools on rock outcrops in the study area. Listed fairy shrimp species known to occur on rock outcrops in southern California include the federally Endangered longhorn fairy shrimp (*Branchinecta longiantenna*) and the federally Threatened vernal pool fairy shrimp (*Branchinecta lynchi*). The federally Endangered Riverside fairy shrimp (*Streptocephalus woottoni*) was addressed in a 2010 USFWS Biological Opinion prepared for a proposed remediation project on Boeing's property at SSFL. The Biological Opinion concluded that the project would have no effect on this species due to the absence of critical habitat on the property. During the Fall 2010 surveys, several basins on rock outcrops were

sighted within the study area. Photographs of some of the sighted basins are provided as Photos 27 through 29 in Appendix D. Only one of the basins (Basin 03) contained water (Appendix D Photo 28). The two largest basins were sighted in Area I (Appendix E Figure E-4).

Freshwater marshes and ponds, and to a certain extent, seasonal wetlands within the study area are highly productive wildlife habitats for amphibians, aquatic reptiles, waterfowl, wading birds, and certain songbirds. Many wildlife species depend on the ponds and associated marshes for their entire life cycles; others use them as temporary refuges or migratory stopover areas. The ponds and associated marshes within the study area provide foraging, nesting and resting habitat for ducks, shorebirds, egrets, and herons including the green heron (*Butorides virescens*) (Appendix D Photo 30). These habitats serve as foraging and breeding habitat for various frogs, salamanders, and aquatic reptiles, and also provide prey opportunities for hawks, owls, coyotes, and foxes.

Intermittent streams and associated riparian habitat, such as coast live oak riparian forest, provide valuable habitat for a variety of wildlife species. Wading birds including the great blue heron (*Ardea herodias*), waterfowl including the mallard (*Anas platyrhynchos*), and other birds including the red-winged blackbird (*Agelaius phoeniceus*) utilize the intermittent streams when they are inundated during the wet season. The associated riparian habitats provide foraging habitat and cover for raptors, owls, and a variety of mammal species.

A total of three inactive raptor stick nests were sighted within the study area during the surveys. Although these nests were inactive during the surveys, they could potentially be used by raptors during the nesting season. A fourth nest was suspected to potentially exist on a cliff north of the LOX Site (Appendix E Figure E-4). Although a nest was not seen on the cliff, a pair of red-tailed hawks was regularly sighted in the area and whitewash and prey remains existed at the bottom of the cliff, suggesting the potential presence of a nest somewhere on the cliff (Appendix D Photos 31 and 32). All of the stick nests that were sighted (Stick Nests 01, 02, and 03) existed around the Alfa Site in Area II (Appendix E Figures E-2 and E-3). Stick Nest 01 is a large nest on a man-made structure within the Alfa Site (Appendix D Photos 33 and 34); Stick Nest 02 is on a cliff south of the Alfa Site (Appendix D Photos 35 and 36); and Stick Nest 03 is on a cliff southwest of the Alfa Site (Appendix D Photos 37 and 38).

SECTION 5

Conclusions and Recommendations

5.1 Conclusions

All of the natural and non-natural habitat types that exist on NASA-administered property at SSFL were characterized and mapped during the Fall 2010 surveys. The habitat assessments were not limited by season; therefore, the habitat characterizations and mapping conducted are considered to be accurate and comprehensive. The primary natural habitats on NASA-administered property are baccharis scrub, chaparral, coast live oak riparian forest, coast live oak woodland, freshwater marsh, mulefat scrub, non-native grassland, Venturan coastal sage scrub, southern willow scrub, and undifferentiated wetland. The primary non-natural habitats on NASA-administered property are developed, open water, and ruderal. Chaparral (172.63 acres) is the dominant natural habitat type and developed (58.10) is the dominant non-natural habitat type. Overall, the natural habitats on NASA-administered property have relatively good ecological quality and functionality. The effects of recent fires appeared to be relatively minor and impacts from past site operations appeared mostly limited to habitats near developed areas.

No specimens of the federally Endangered Braunton's milk-vetch were sighted on NASA-administered property during the surveys. This plant species has not been sighted on NASA-administered property at SSFL in the past but was expected to have potentially recruited onto NASA-administered property following recent fires near SSFL. Based on inspections of Braunton's milk-vetch at a known location on Boeing's property during the surveys, the species was in a state of senescence. Although senescent, the species appeared to be readily identifiable; therefore, the species-specific survey conducted is considered reliable.

The Santa Susana tarplant, which is state-listed as Rare, was sighted in 3,657 locations on NASA-administered property during the surveys. This species was in bloom and, therefore, easily identifiable during the surveys. It was primarily found in sandstone outcrop habitat and the majority of the sightings were in Area II.

Dudleya surveys focused on non-chalky species of dudleya because non-chalky specimens could potentially be listed or special-status species. Because the dudleya plants are not in bloom during fall, a comprehensive survey of listed and special-status species of dudleya was not conducted. Non-chalky dudleya plants were sighted in 30 locations, all of which were in Area II. The plants were almost exclusively associated with remnant patches of grasses on north-facing sandstone slopes. The recorded dudleya locations represent areas and habitats where listed and special-status species of dudleya could potentially occur.

The California black walnut is not state or federally listed but is considered vulnerable due to overgrazing and habitat loss. Three individual California black walnut trees were sighted during the surveys. This species is easily identifiable during any season; therefore, the species-specific survey conducted is considered reliable.

Species-specific surveys for listed/special-status animal species were not conducted during the Fall 2010 surveys; however, opportunistic wildlife observations were recorded. A total of 7 herpetile species, 51 bird species, and 10 mammal species were identified during the

surveys. One SSC reptile species (coast horned lizard), one SSC bird species (loggerhead shrike), and one fully protected mammal species (ring-tailed cat) were sighted, and one federally Endangered butterfly species (Quino checkerspot butterfly) was potentially sighted. Several basins on rock outcrops that could potentially support listed fairy shrimp species were found. A total of three inactive raptor stick nests were sighted and a fourth nest was suspected to exist on a cliff based on the presence of whitewash and prey remains at the bottom of the cliff. Although the sighted nests were inactive during the surveys, they could potentially be used by raptors during the nesting season.

5.2 Recommendations

The habitat characterizations and mapping conducted during the Fall 2010 surveys are considered to be accurate and comprehensive; therefore, additional habitat assessments are not recommended for the near term. Additional surveys for listed, special-status, and common plant and animal species are recommended to be conducted during springtime to complement the findings of the Fall 2010 surveys. During fall, most of the annual plants are in a state of senescence and not easily identifiable. Many animal species, including several species of migratory birds, also do not occur in the area during fall. A spring survey would provide a more comprehensive assessment of certain listed/special status plant species as well as a more comprehensive inventory of common plant and animal species on NASA-administered property.

Specifically, a spring dudleya survey is recommended to provide a more comprehensive assessment of listed and special-status species of dudleya on NASA-administered property. During spring, the species and protection status of the dudleya plants found during the Fall 2010 surveys could be determined, and additional focused surveys could be conducted in specific habitats. Focused spring surveys are also recommended for listed fairy shrimp species; species that occur in seasonal drainages and undifferentiated wetlands; and nesting birds, including raptors. The occurrence location for Braunton's milk-vetch shown on the CNDDB map is also recommended to be revisited during spring to confirm the presence or absence of this species in this area. Further assessment of potential Quino checkerspot butterfly occurrence on the property could also be considered for the spring surveys.

SECTION 6

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Appendix A
Habitat Mapping

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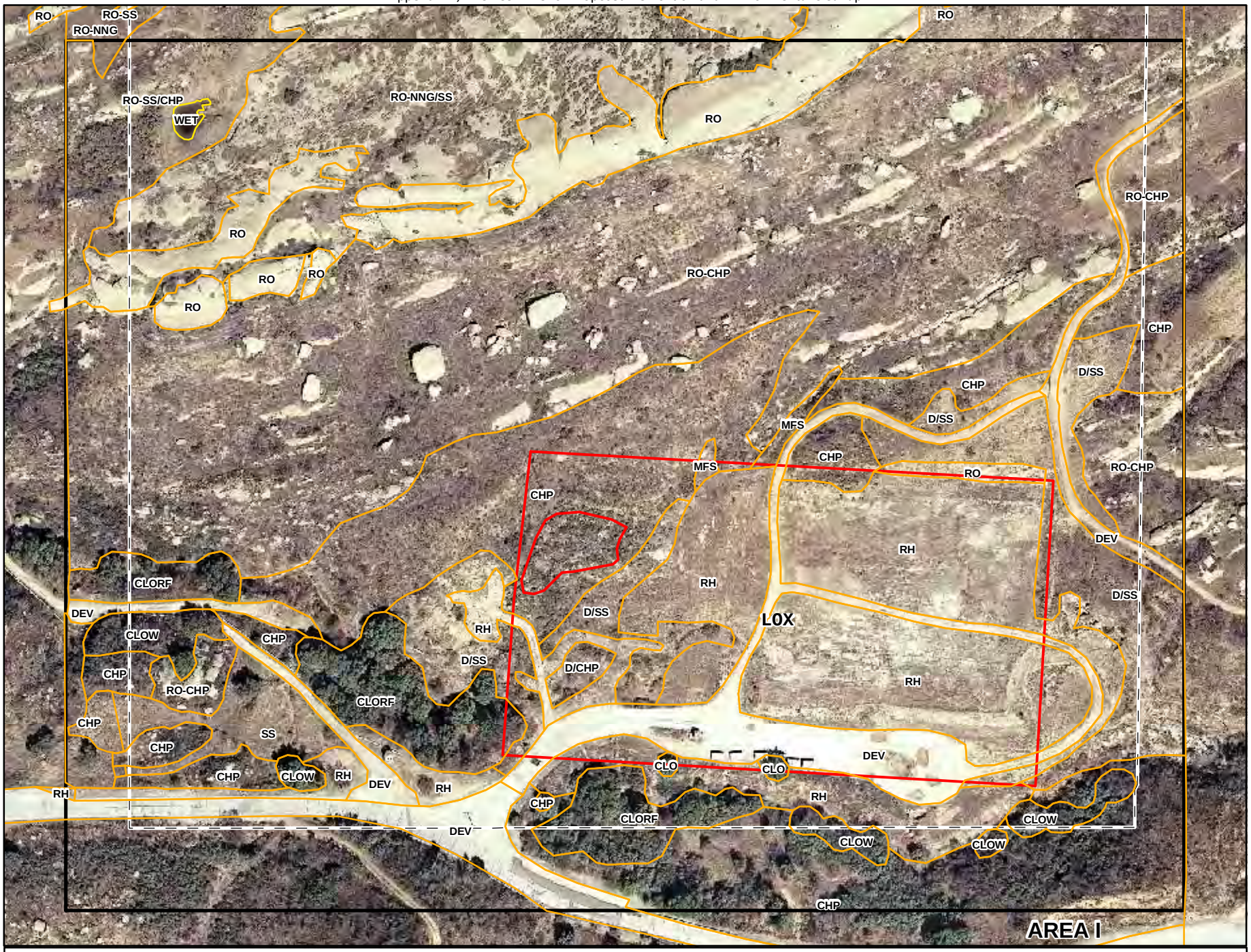

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Notes:

1. Base map aerial photography dated 2007.
2. Habitat boundaries are approximate as shown based on in-field reference to surface features.
3. Habitat classifications are based on Holland (1986) except where no suitable category exists.

Legend

- Grid
- SWMU or AOC
- NASA Property Boundary
- Wetland

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Santa Susana Field Laboratory
Ventura County, California

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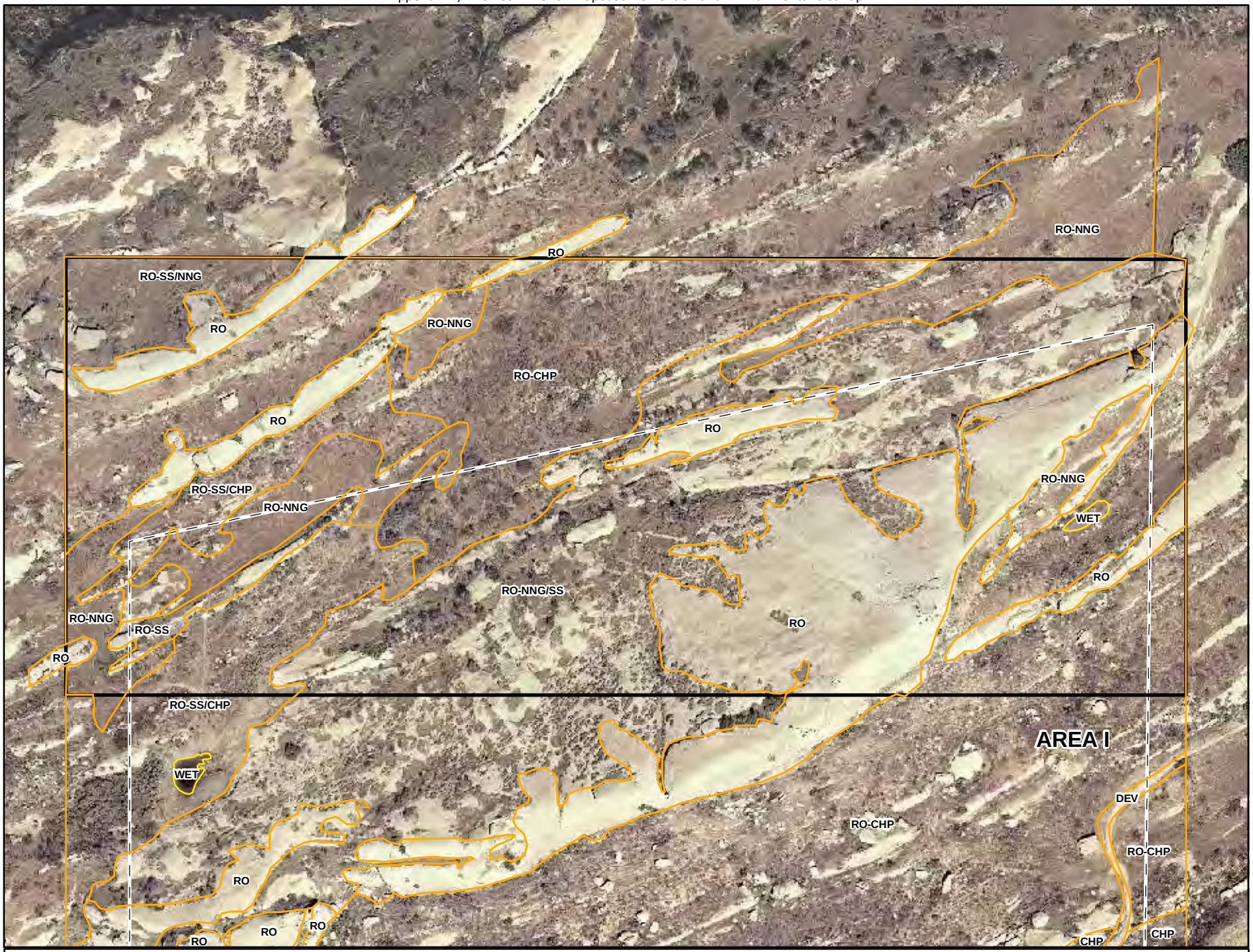

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Wetland

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Santa Susana Field Laboratory
Ventura County, California

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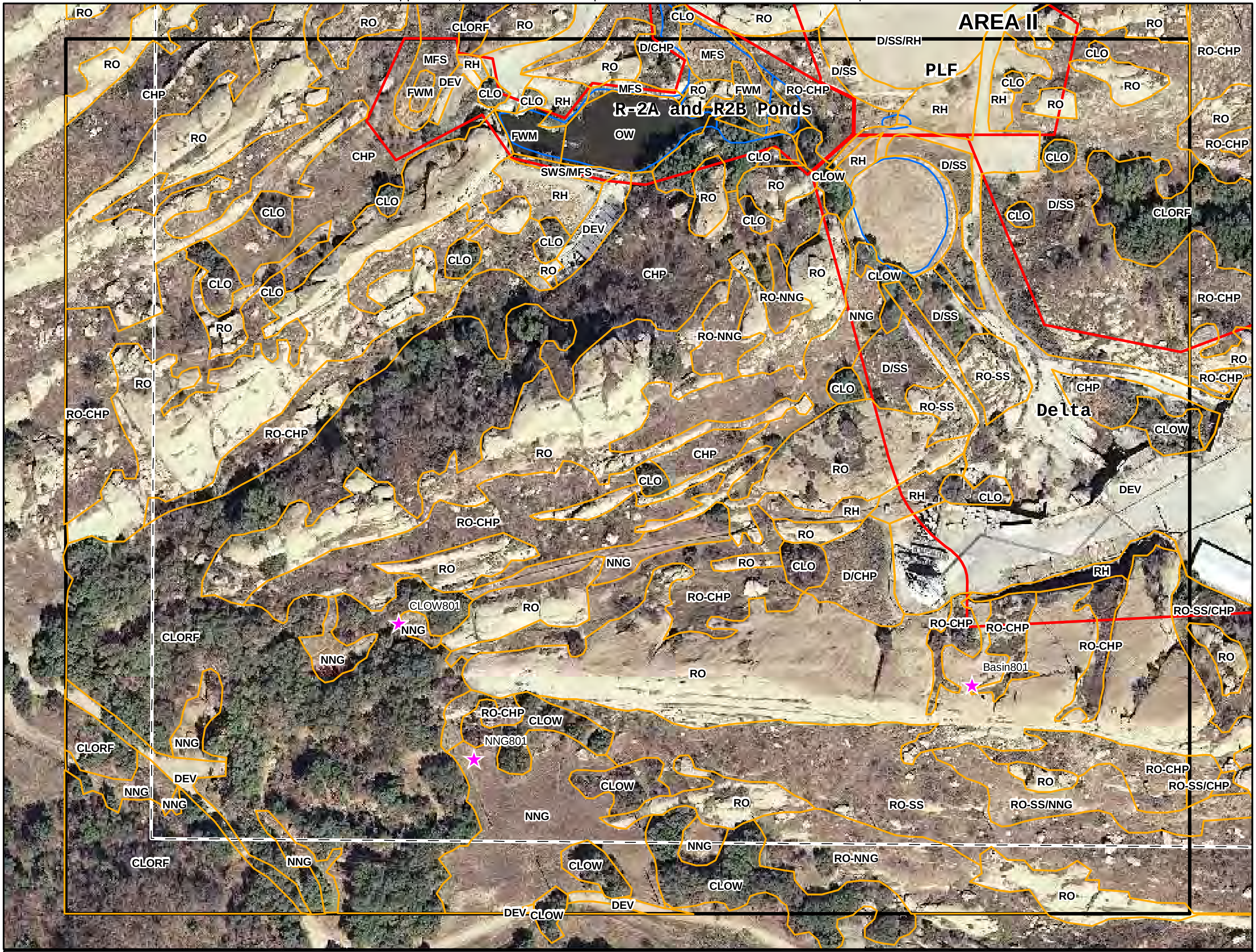

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3. Habitat classifications are based on Holland (1986) except where no suitable category exists.

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- Wetlands
- Grid
- SWMU or AOC
- NASA Property Boundary
- Pond

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Santa Susana Field Laboratory
Ventura County, California

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Coca
Delta
FWM OW01 SWS
RO
RH
CHP
RO-CHP
RO-SS
RO-NNG/SS
D/SS
D/CHP
CLO
CLOW
CLORF
MFS
DEV
WET
OW
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RO-SS
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Grid
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Pond
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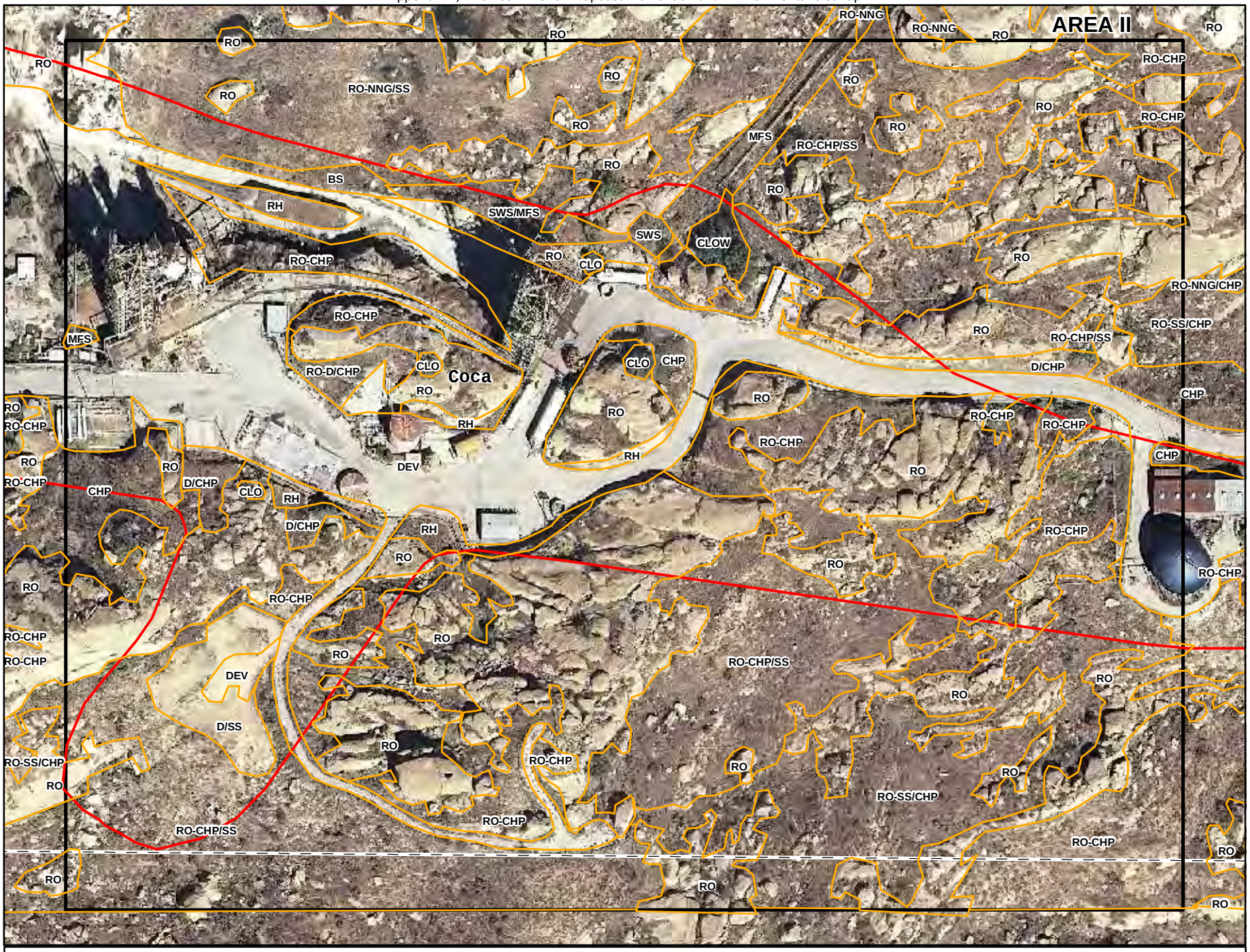

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- NASA Property Boundary
- Pond

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Santa Susana Field Laboratory
Ventura County, California

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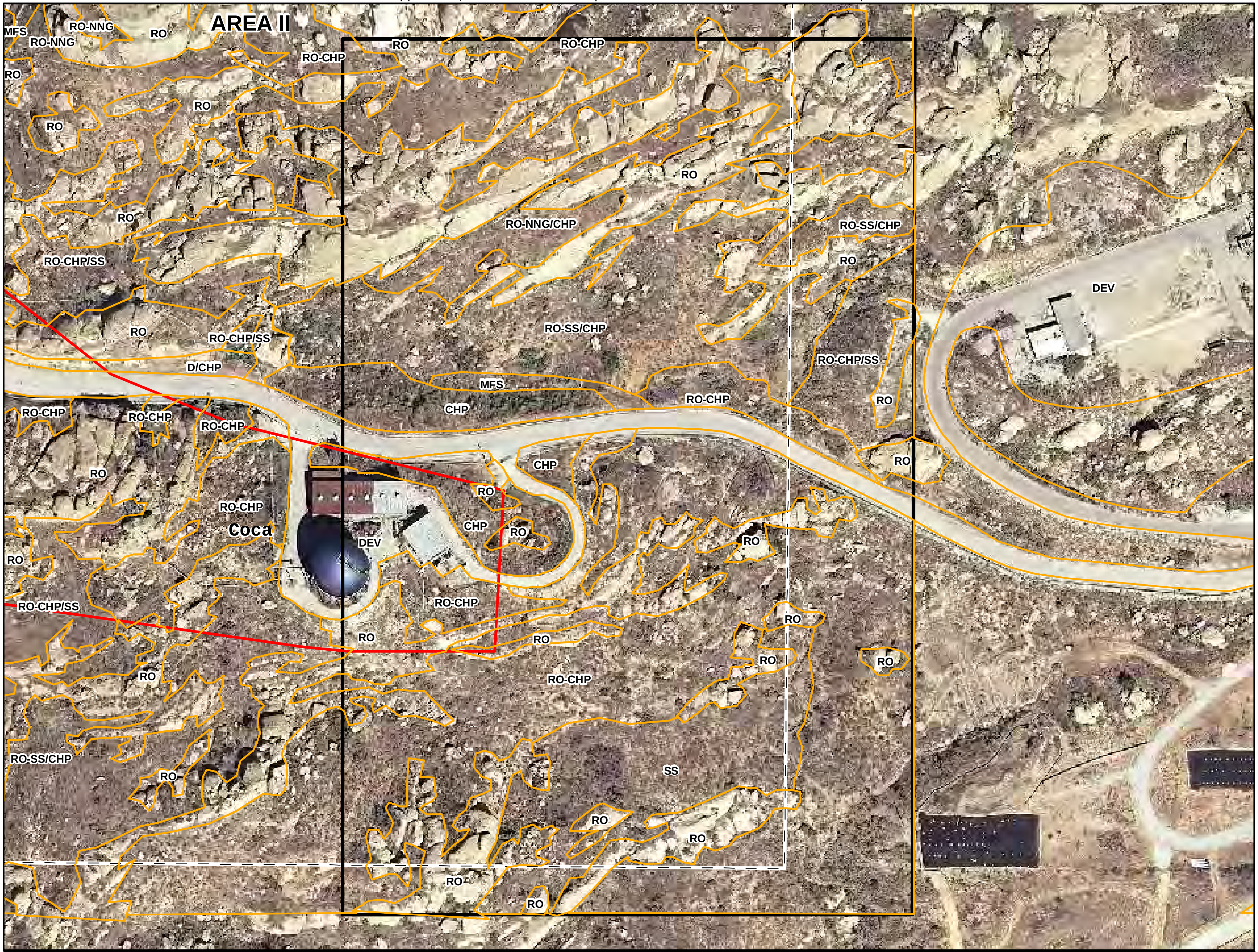

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- NASA Property Boundary
- Pond

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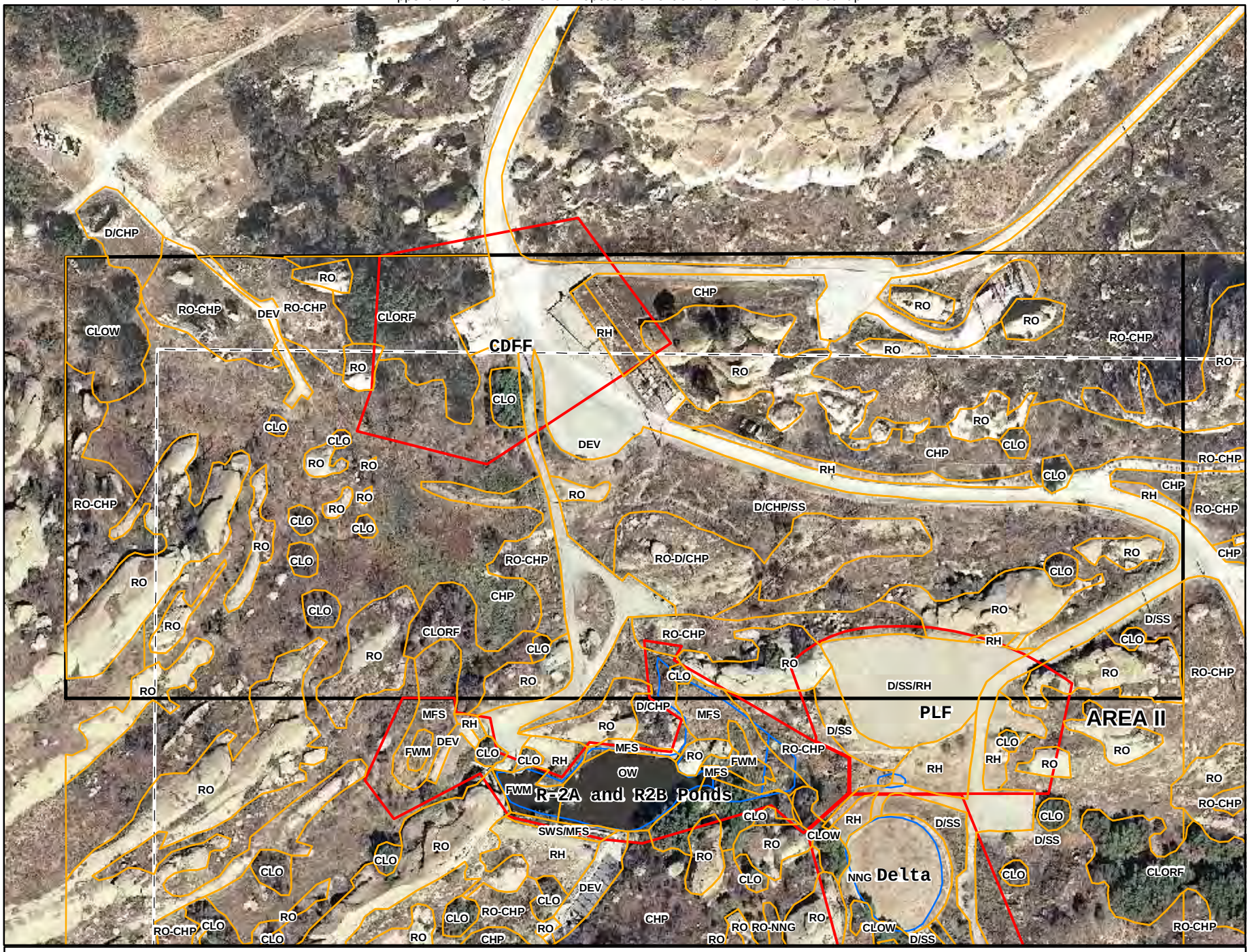

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- Pond

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Ventura County, California

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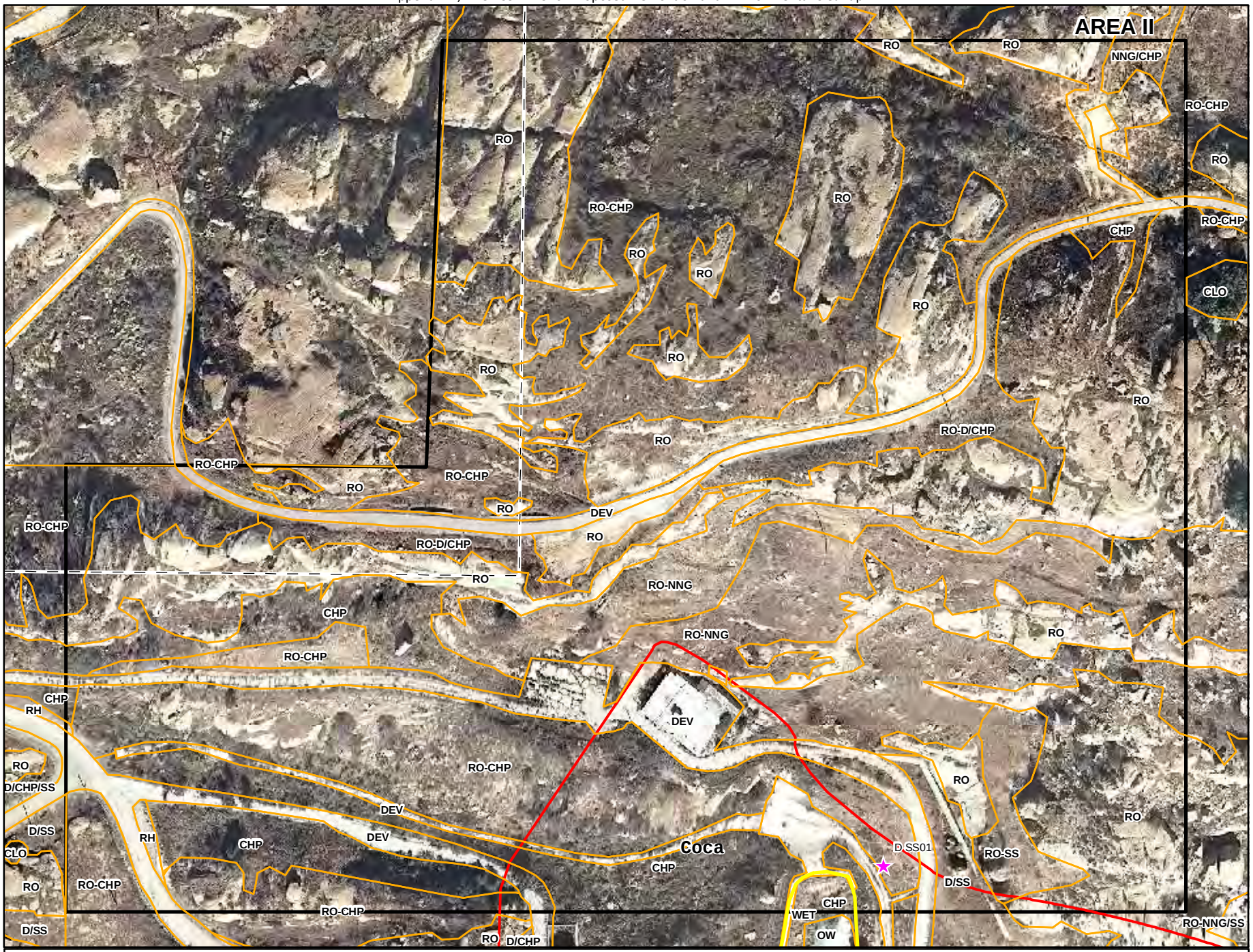

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Legend

- Natural Community Data Sheet Points
- Wetlands
- Grid
- SWMU or AOC
- NASA Property Boundary
- Pond

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Ventura County, California

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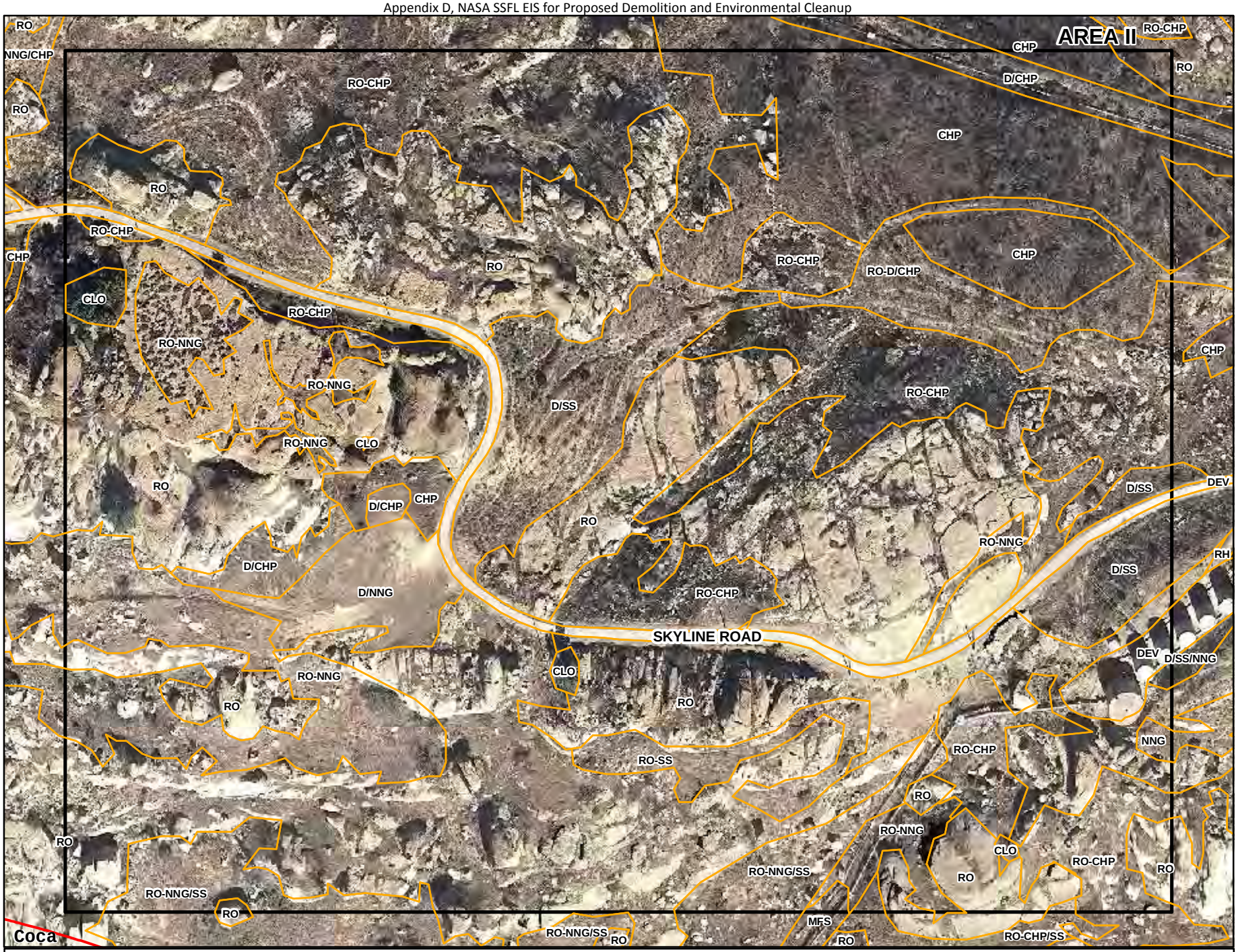

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Legend

- Grid
- SWMU or AOC
- NASA Property Boundary
- Pond

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Santa Susana Field Laboratory
Ventura County, California

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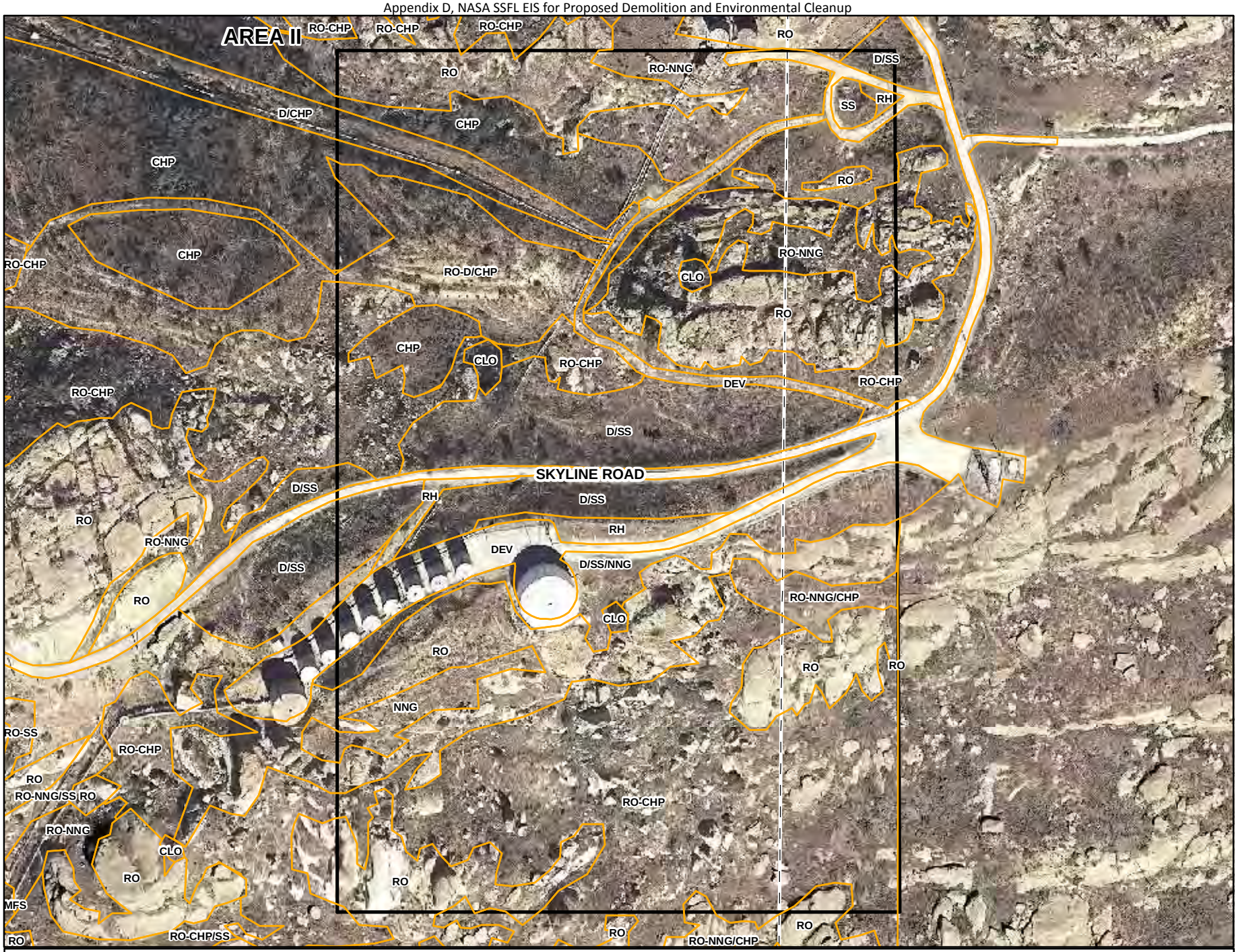

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- NASA Property Boundary
- Pond

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Santa Susana Field Laboratory
Ventura County, California

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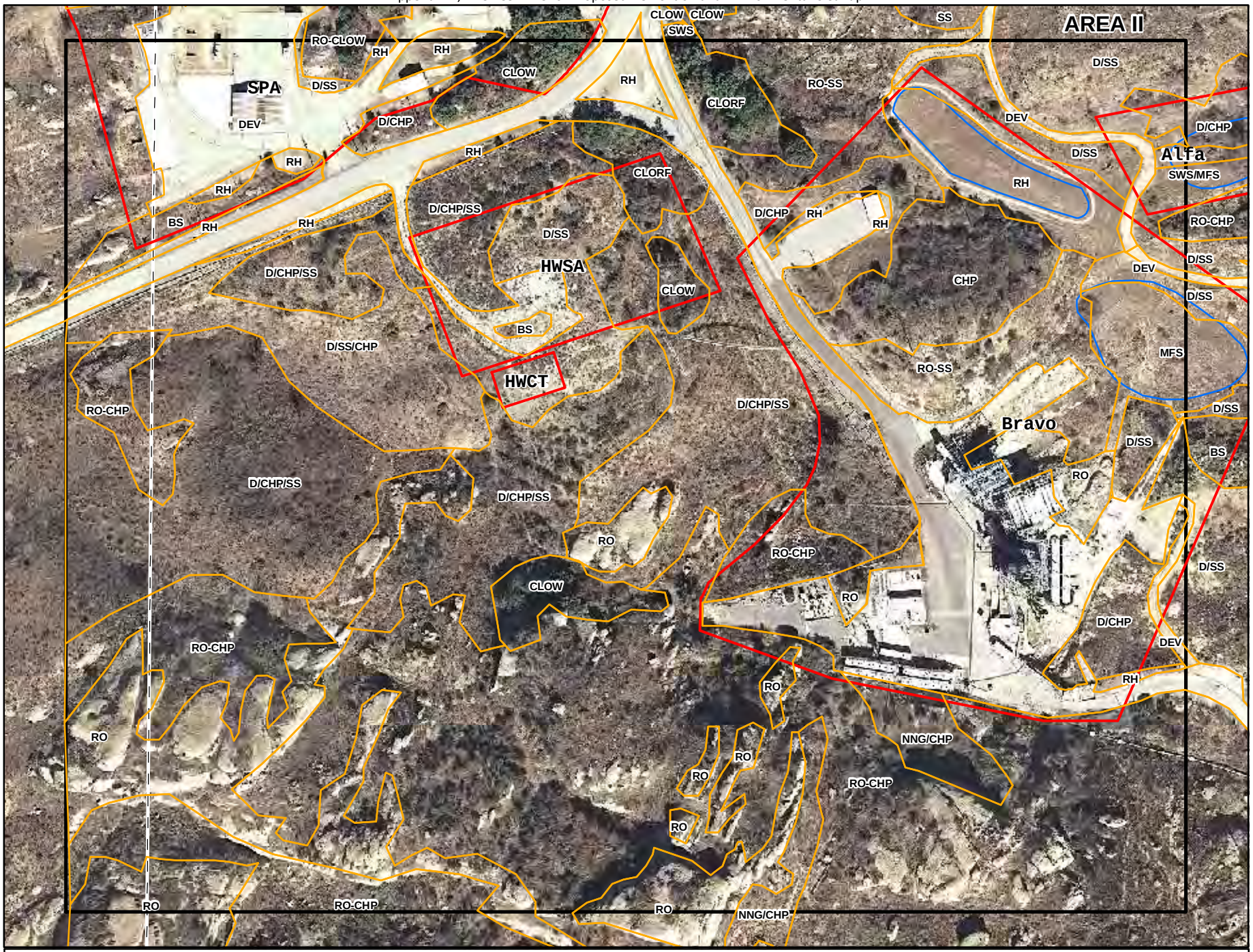

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Legend

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- SWMU or AOC
- NASA Property Boundary
- Pond

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Santa Susana Field Laboratory
Ventura County, California

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Legend

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- NASA Property Boundary
- Pond

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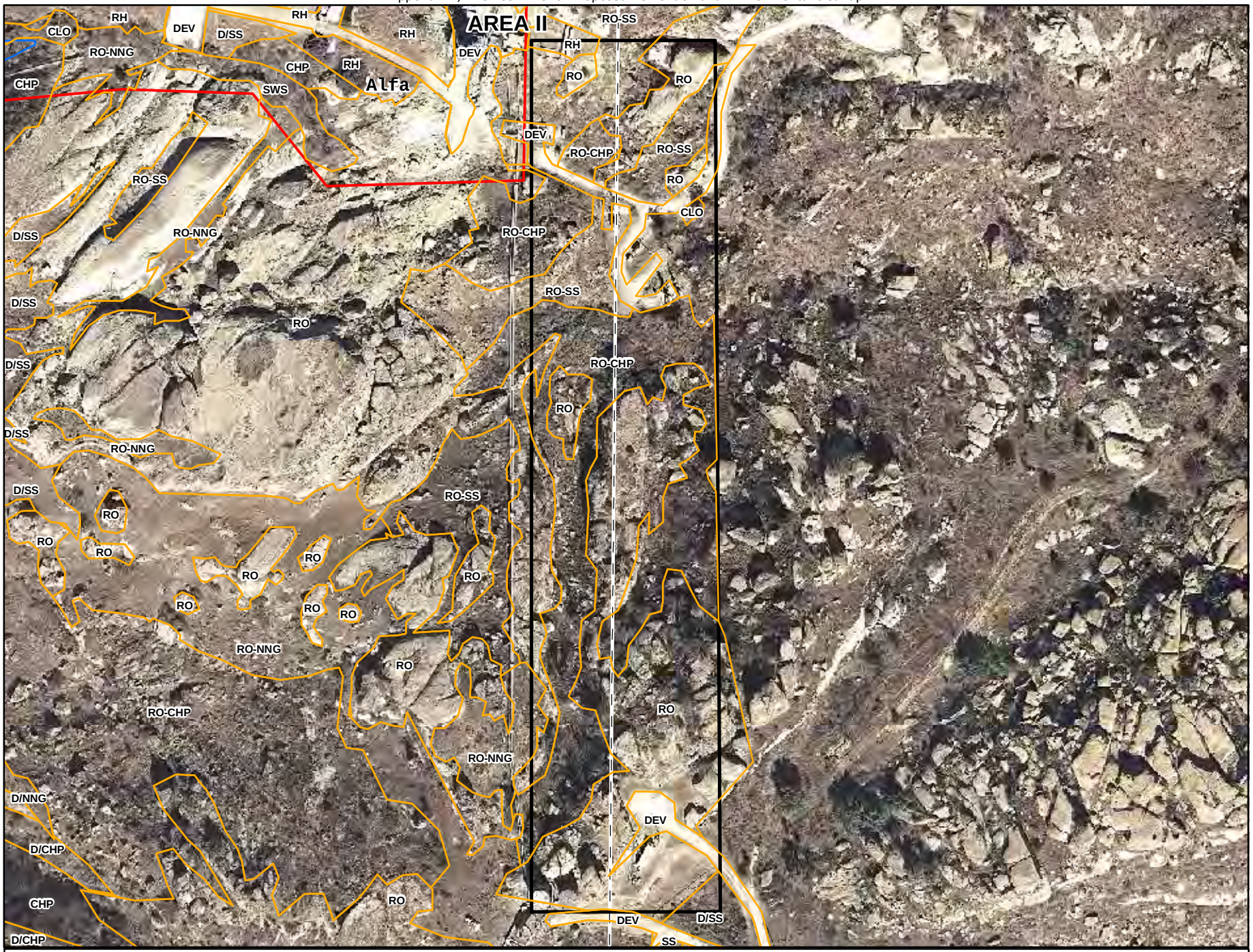

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Legend

- Grid
- SWMU or AOC
- NASA Property Boundary
- Pond

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Santa Susana Field Laboratory
Ventura County, California

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0 25 50 100 150 200 Feet

Notes:

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Legend

- Grid
- SWMU or AOC
- NASA Property Boundary
- Pond

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Santa Susana Field Laboratory
Ventura County, California

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5-JAN-2011
Drawn By:
A. Cooley

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Notes:

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3. Habitat classifications are based on Holland (1986) except where no suitable category exists.

Legend

- Natural Community Data Sheet Points
- Wetlands
- Grid
- SWMU or AOC
- NASA Property Boundary
- Pond

A2-13
NASA Habitat Survey - Fall 2010
Santa Susana Field Laboratory
Ventura County, California

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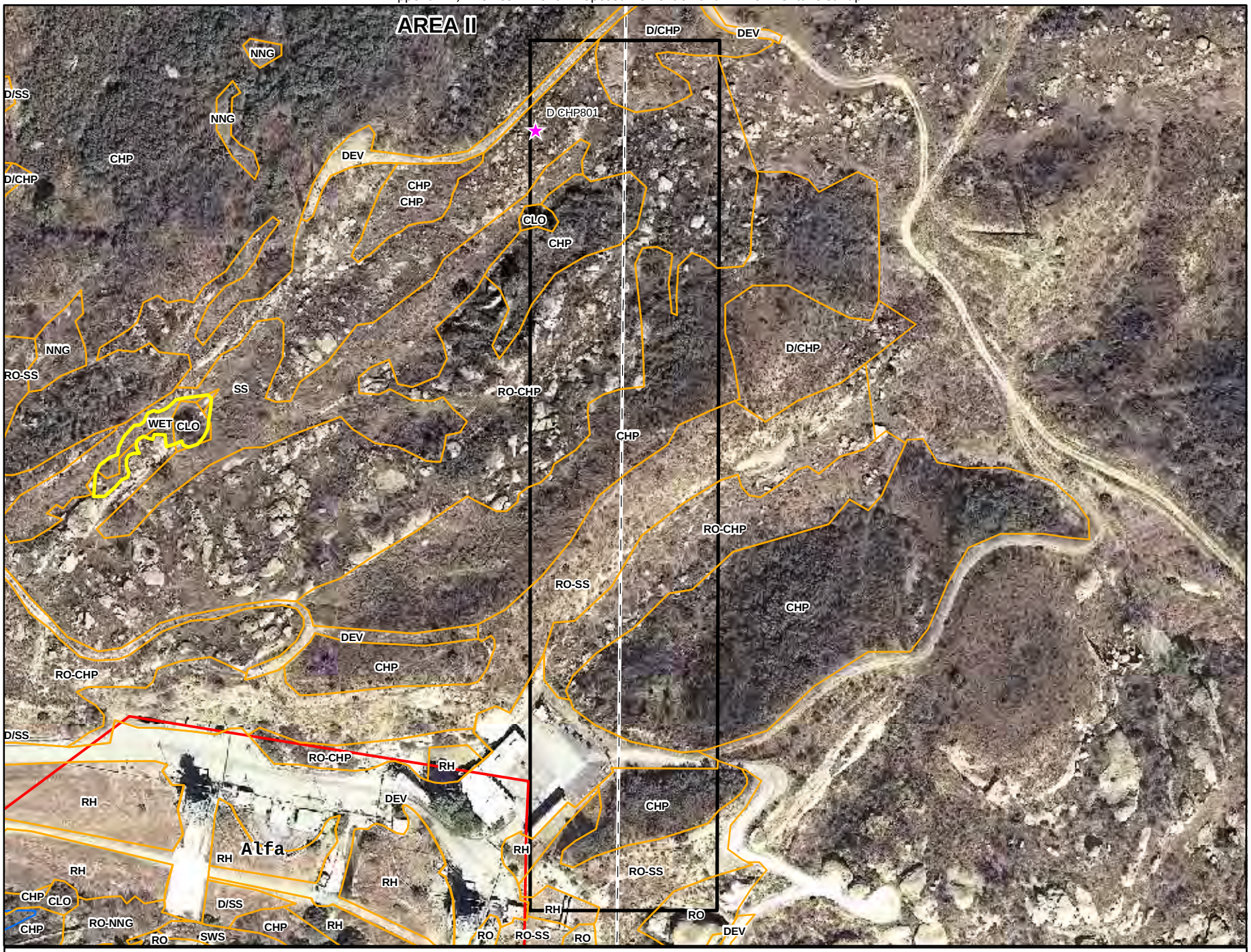

5-JAN-2011
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A. Cooley

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Notes:

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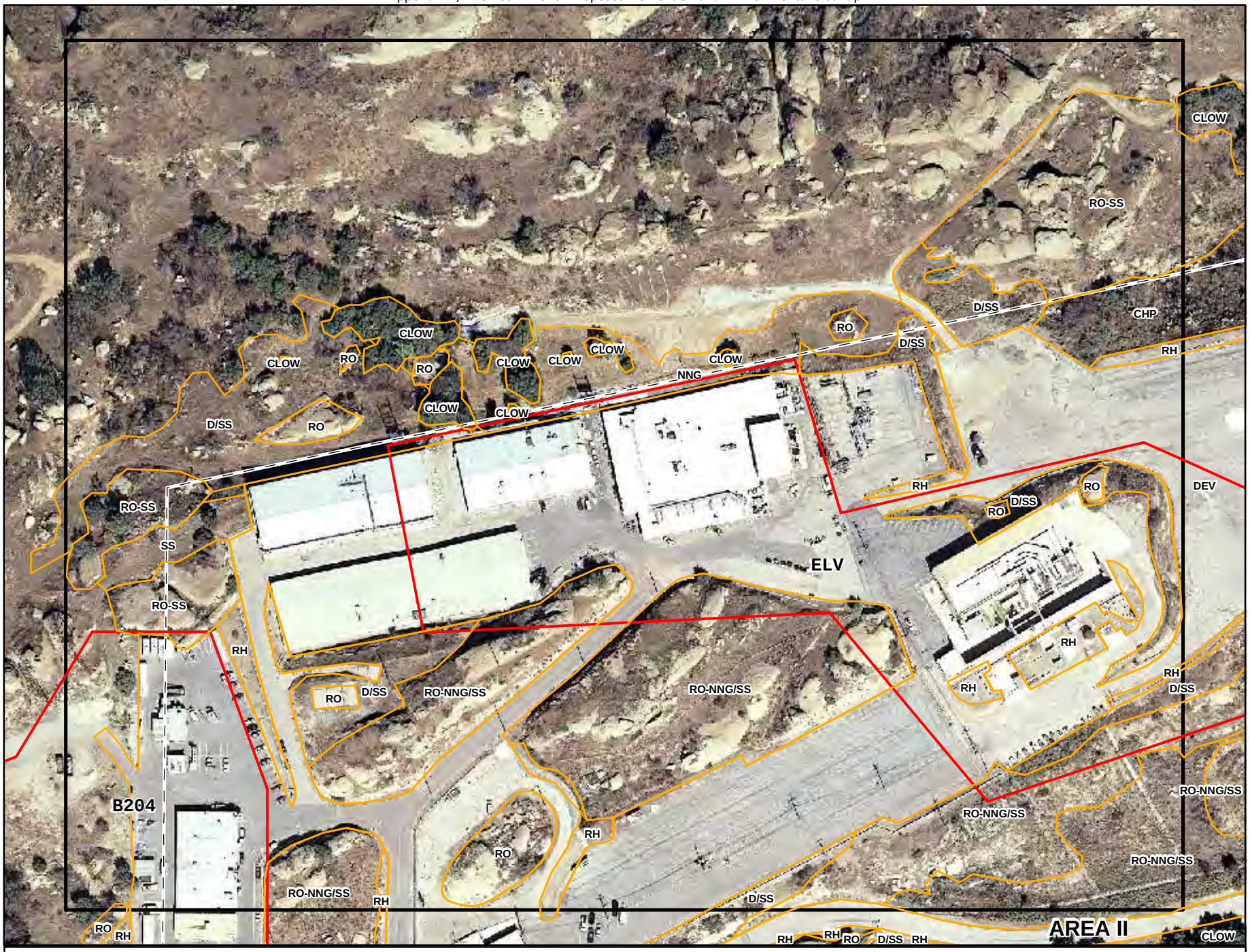
2. Habitat boundaries are approximate as shown based on in-field reference to surface features.
3. Habitat classifications are based on Holland (1986) except where no suitable category exists.

Legend

- Natural Community Data Sheet Points
- Wetlands
- Grid
- SWMU or AOC
- NASA Property Boundary
- Pond

A2-14
NASA Habitat Survey - Fall 2010
Santa Susana Field Laboratory
Ventura County, California

Map Document:(O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_Habitat_A2-14.mxd)



Notes:

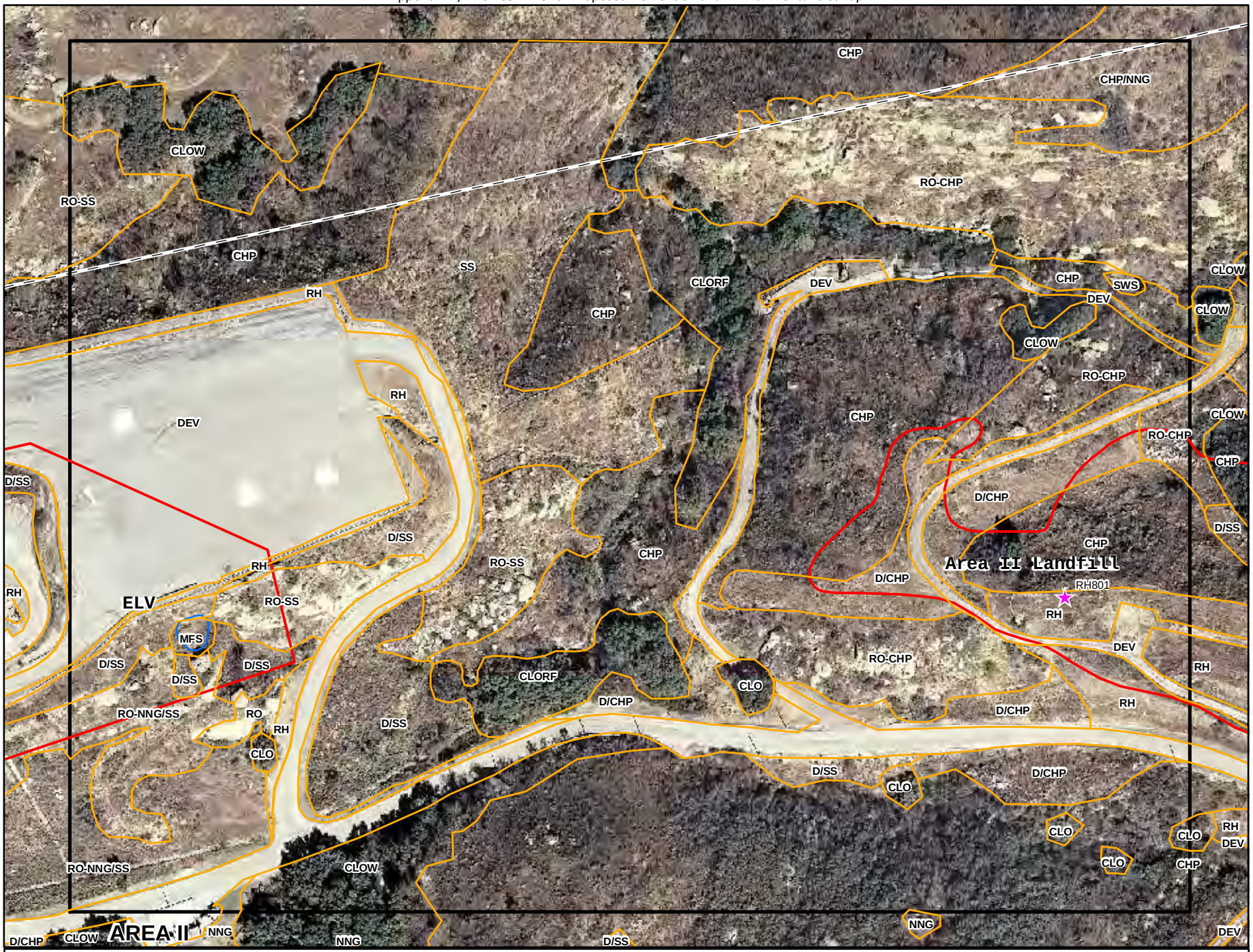
1. Base map aerial photography dated 2007.
2. Habitat boundaries are approximate as shown based on in-field reference to surface features.
3. Habitat classifications are based on Holland (1986) except where no suitable category exists.

Legend

- Grid
- SWMU or AOC
- NASA Property Boundary
- Pond

A2-15
NASA Habitat Survey - Fall 2010
Santa Susana Field Laboratory
Ventura County, California

Map Document:(O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_Habitat_A2-15.mxd)



4-JAN-2011
Drawn By:
A. Cooley

0 25 50 100 150 200 Feet

Notes:

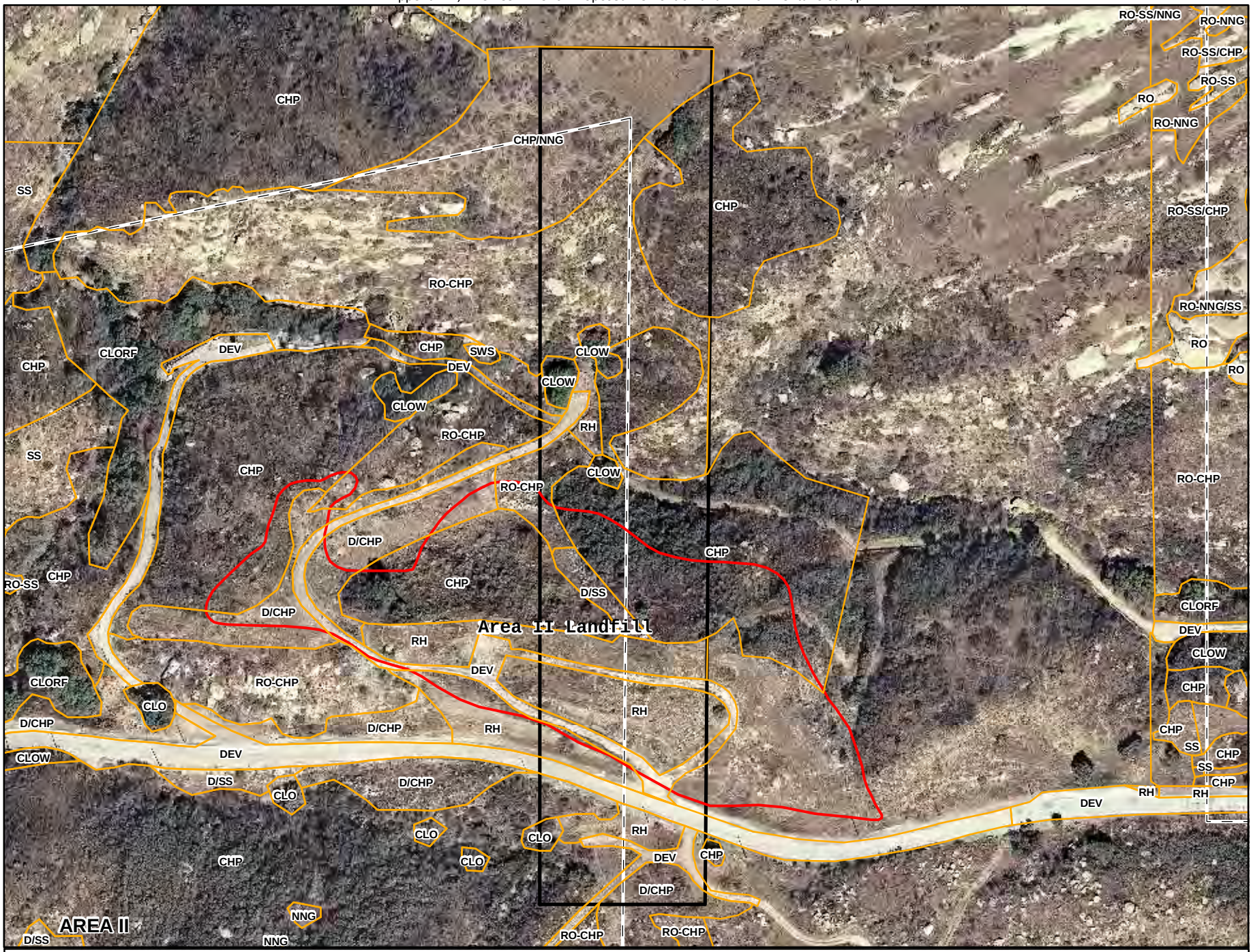
1. Base map aerial photography dated 2007.
2. Habitat boundaries are approximate as shown based on in-field reference to surface features.
3. Habitat classifications are based on Holland (1986) except where no suitable category exists.

Legend

- Natural Community Data Sheet Points
- Wetlands
- Grid
- SWMU or AOC
- NASA Property Boundary
- Pond

A2-16
NASA Habitat Survey - Fall 2010
Santa Susana Field Laboratory
Ventura County, California

Map Document:(O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_Habitat_A2-16.mxd)



4-JAN-2011
Drawn By:
A. Cooley

0 25 50 100 150 200 Feet

Notes:

1. Base map aerial photography dated 2007.
2. Habitat boundaries are approximate as shown based on in-field reference to surface features.
3. Habitat classifications are based on Holland (1986) except where no suitable category exists.

Legend

- Grid
- SWMU or AOC
- NASA Property Boundary
- Pond

A2-17
NASA Habitat Survey - Fall 2010
Santa Susana Field Laboratory
Ventura County, California

Map Document:(O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_Habitat_A2-17.mxd)

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Appendix B
Natural Community Datasheets

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NASA Santa Susana Field Laboratory
Natural Community Datasheet

ID#: CLOW801

Lat/Long: 34°13'29.4"/118°42'24.9"

Date: 10/08/2010

Investigators: S. Long; G. Santolo

Community Type: Coast Live Oak Woodland

Photos: Attached

Dominant Vegetation (Stratum: T/S/H): Tree- *Quercus agrifolia* (coast live oak) / Shrub- *Sambucus mexicana* (blue elderberry), *Toxicodendron diversilobum* (poison oak) / Herb - *Phragmites australis* (common reed grass), *Carduus pycnocephalus* (Italian thistle), *Rosa californica* (wild rose), *Avena* sp. (oat), other grasses (indeterminate)

Habitat Quality: Adjacent to pond in Coca Site

Invasive Species: common reed, Italian thistle

Wildlife Observations: Nuttall's woodpecker (*Picoides nuttallii*), western scrub-jay (*Aphelocoma californica*), mule deer (*Odocoileus hemionus*), small mammal burrows

Notes:

Coast Live Oak Woodland habitat

NASA Santa Susana Field Laboratory
Natural Community Datasheet

ID#: D-CHP801

Lat/Long: 34°13'08.8"/118°41'33.4"

Date: 10/08/2010

Investigators: S. Long; G. Santolo

Community Type: Disturbed Chaparral

Photos: Attached

Dominant Vegetation (Stratum: T/S/H): Tree - *Quercus agrifolia* (coast live oak; occassional), *Crataegus* sp. (hawthorn), *Ceanothus* sp. (California lilac) / Shrub - *Adenostoma fasciculatum* (chamise), *Ribes malvaceum* (chaparral currant), *Phacelia ramosissima* (branching phacelia), *Eriodictyon californicum* (Thickleaf yerba santa), *Yucca schidigera* (yucca), *Salvia mellifera* (black sage) / Herb – *Acmispon glaber* (deer weed), *Eriogonum fasciculatum* (California buckwheat) *Bromus diandrus* (ripgut brome), *Bromus madritensis* ssp. *rubens* (red brome)

Habitat Quality: Area had been previously burned in the 2005 fires

Invasive Species: None

Wildlife Observations: Cooper's hawk (*Accipiter cooperii),* bushtit (*Psaltriparus minimus*), California thrasher (*Toxostoma redivivum*), yellow-rumped warbler (*Dendroica coronata*), western scrub-jay (*Aphelocoma californica*), spotted towhee (*Pipilo maculatus*), coyote scat (*Canis latrans*), mule deer trails (*Odocoileus hemionus*), small mammal burrows

Notes: Excellent cover, but no water sources

Disturbed Chaparral habitat

NASA Santa Susana Field Laboratory
Natural Community Datasheet

ID#: D-SS01

Lat/Long: 34°13'37.5"/118°42'00.6"

Date: 10/08/2010

Investigators: S. Long; G. Santolo

Community Type: Disturbed Sage Scrub

Photos: Attached

Dominant Vegetation (Stratum: T/S/H): Tree – None / Shrub - *Salvia leucophylla* (Purple sage*)*, *Eriodictyon californicum* (Thickleaf yerba santa), *Baccharis pilularis* (coyote brush), *Baccharis salicifolia* (mulefat) / Herb - *Heterotheca grandiflora* (telegraph weed), *Acmispon glaber* (deer weed), *Brassica nigra* (black mustard)

Habitat Quality: Adjacent to pond in Coca site; previously burned in 2005

Invasive Species: None

Wildlife Observations: Western fence lizard (*Sceloporus occidentalis*), rufous hummingbird (*Selasphorus rufus*), white-throated swifts (*Aeronautes saxatalis*), black phoebe (*Sayornis nigricans*), western scrub-jay (*Aphelocoma californica*), California towhee (*Melozone crissalis*), desert cottontail (*Sylvilagus audubonii*), small mammal burrows

Notes: Adjacent to roadways

Disturbed Sage Scrub habitat

NASA Santa Susana Field Laboratory
Natural Community Datasheet

ID#: FWM-OW01

Lat/Long: 34°13'35.7"/118°42'01.7"

Date: 10/08/2010

Investigators: S. Long; G. Santolo

Community Type: Freshwater Marsh – Open Water

Photos: Attached

Dominant Vegetation (Stratum: T/S/H): Tree - *Salix lasiolepis* (arroyo willow) / Shrub - *Baccharis pilularis* (coyote brush), *Baccharis salicifolia* (mulefat), *Malosma laurina* (laurel sumac) / Herb - *Deinandra minthornii* (Santa Susana tarplant), *Acmispon glaber* (deer weed), *Typha latifolia* (broad-leaved cattail)

Habitat Quality: Relatively diverse vegetation; unknown chemical stressor

Invasive Species: None

Wildlife Observations: Dragonflies (*Odonata* sp.), fish (possibly *Gambusia*), belted kingfisher (*Megaceryle alcyon*), wrentit (*Chamaea fasciata*), yellow-rumped warbler (*Dendroica coronata*), spotted towhee (*Pipilo maculatus*), American goldfinch (*Spinus tristis*)

Notes: Aeration spray device (possibly to address VOCs in runoff); concrete reinforced construction with soil accumulations

Freshwater Marsh-Open Water habitat

NASA Santa Susana Field Laboratory
Natural Community Datasheet

ID#: RO-NNG

Lat/Long: 34°13'52.3"/118°41'36.7"

Date: 10/01/2010

Investigators: S. Long; G. Santolo

Community Type: Rock Outcrop – Non-native Grassland

Photos: Attached

Dominant Vegetation (Stratum: T/S/H): Tree – None / Shrub – None / Herb - *Avena fatua* (oat), *Eremocarpus setigerus* (doveweed), *Conyza canadensis* (Canadian horseweed), *Brassica nigra* (black mustard), *Bromus diandrus* (ripgut brome), *Bromus madritensis* ssp. *rubens* (red brome)

Habitat Quality: Relatively undisturbed

Invasive Species: Canadian horseweed

Wildlife Observations: Possible raptor stick nest in this area, mule deer, vole runways, grazed plants, and woodrat scat.

Notes:

Rock Outcrop – Non-native Grassland habitat

NASA Santa Susana Field Laboratory
Natural Community Datasheet

ID#: RH801

Lat/Long: 34°13'13.9"/118°42'35.4"

Date: 10/08/2010

Investigators: S. Long; G. Santolo

Community Type: Ruderal

Photos: Attached

Dominant Vegetation (Stratum: T/S/H): Tree – None / Shrub - *Phacelia ramosissima* (branching phacelia), *Centaurea melitensis* (tocalote), *Artemisia californica* (California sagebrush), *Symphyotrichum* or *Dieteria* (purple aster)? *Salvia apiana* (white sage), *Baccharis pilularis* (coyote brush) / Herb - *Carduus pycnocephalus* (Italian thistle), *Cirsium occidentale* (cobweb thistle), *Rumex crispus* (curly dock), *Brassica nigra* (black mustard), *Acmispon glaber* (deer weed), *Bromus madritensis* ssp. *rubens* (red brome)

Habitat Quality: moderately disturbed

Invasive Species: Italian thistle

Wildlife Observations: Western fence lizard (*Sceloporus occidentalis*), coast horned lizard (*Phrynosoma coronatum* [=*Phrynosoma blainvillii*]), California thrasher (*Toxostoma redivivum*), western scrub-jay (*Aphelocoma californica*), mule deer (*Odocoileus hemionus*), small mammal burrows

Notes: Possible limited fire damage. Most trees not burned but several large old dead trees within rock; scorched trunks.

Ruderal habitat

NASA Santa Susana Field Laboratory
Natural Community Datasheet

ID#: NNG801

Lat/Long: 34°13'27.7"/118°42'23.7"

Date: 10/08/2010

Investigators: S. Long; G. Santolo

Community Type: Non-native Grassland southeast corner

Photos: Attached

Dominant Vegetation (Stratum: T/S/H): Tree - *Quercus agrifolia* (coast live oak) / Shrub - *Toxicodendron diversilobum* (poison oak), *Phacelia ramosissima* (branching phacelia) / Herb - *Avena* sp. (oat)*, Bromus diandrus* (ripgut brome), *Eremocarpus setigerus* (doveweed), *Centaurea melitensis* (tocalote), *Centaurea solstitialis* (yellow star thistle)

Habitat Quality: Previously burned in 2005

Invasive Species: yellow star thistle

Wildlife Observations: Acorn woodpecker (*Melanerpes formicivorus*), black-chinned hummingbird (*Archilochus alexandri*), wrentit (*Chamaea fasciata*), western scrub-jay (*Aphelocoma californica*), coyote scat (*Canis* latrans), gopher burrows (*Thomomys bottae*), mule deer (*Odocoileus hemionus*), small mammal burrows

Notes: Possible limited fire damage. Most trees not burned but several large old dead trees within rock; scorched trunks.

Non-native Grassland habitat

NASA Santa Susana Field Laboratory
Natural Community Datasheet

ID#: RO-NE corner

Lat/Long: 34°14'26.5"/118°41'07.0"

Date: 9/28/2010

Investigators: S. Long; G. Santolo

Community Type: Rock Outcrop

Photos: Attached

Dominant Vegetation (Stratum: T/S/H): Tree – None / Shrub – None / Herb - *Malosma laurina* (laurel sumac), *Brassica* sp. (mustard), *Deinandra minthornii* (Santa Susana tarplant), *Avena fatua* (wild oat), *Bromus madritensis* ssp. *rubens* (red brome)

Habitat Quality: Relatively undisturbed except for foot trails. Depauperate rock outcrop with sand seams and accumulations where plants take hold.

Invasive Species: None

Wildlife Observations: Western fence lizard (*Sceloporus occidentalis*)

Notes: Elevation ~600 feet

Rock Outcrop with sand seams and accumulations where Santa Susana tarplants take root.

Appendix C
Plant List

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APPENDIX C

Plant Species Identified During April 2008 and May 2009 Surveys of RFI Areas on NASA-Administered Property at SSFL

Common Name	Scientific Name	Group 2 Sites					Group 3 Sites						Group 9 Sites	
		LOX	Landfill	ELV	Ash Pile	B515 STP	Alfa	Bravo	ABFF	SPA	B204	WCT	R2 Ponds	CDFF
Agave (ornamental)	*Agave* sp.						X							
Arroyo willow	*Salix lasiolepis*												X	
Black mustard	*Brassica nigra*	X	X		X									
Black sage	*Salvia mellifera*	X		X	X	X				X		X		
Blue dick	*Dichelostemma capitatum*				X		X	X	X			X		
Blue elderberry	*Sambucus mexicana*												X	X
Branching phacelia	*Phacelia ramosissima*	X		X			X	X	X	X	X	X	X	X
Broad-leaved cattail	*Typha latifolia*												X	
California buckwheat	*Eriogonum fasciculatum*						X	X			X	X		
California burclover	*Medicago polymorpha*						X		X	X				
California dodder	*Cuscuta californica*					X	X		X			X		X
California everlasting	*Gnaphalium californicum*			X			X	X			X			X
California poppy	*Escholzia californica*						X							
California or coastal sagebrush	*Artemisia californica*	X	X	X	X	X			X	X	X	X		X
Canadian horseweed	*Conzya canadensis*	X				X		X						
Canyon sunflower	*Venegasia carpesoides*							X	X				X	
Chalk live-forever	*Dudleya pulverulenta*										X		X	X
Chamise	*Adenostoma*	X	X				X	X	X	X	X	X	X	X

APPENDIX C

Plant Species Identified During April 2008 and May 2009 Surveys of RFI Areas on NASA-Administered Property at SSFL

Common Name	Scientific Name	Group 2 Sites					Group 3 Sites						Group 9 Sites	
		LOX	Landfill	ELV	Ash Pile	B515 STP	Alfa	Bravo	ABFF	SPA	B204	WCT	R2 Ponds	CDFF
	fasciculatum													
Chaparral currant	*Ribes malvaceum*						X					X		X
Chaparral yucca	*Yucca whippleri*	X							X		X	X	X	X
Chia sage, Chia	*Salvia columberiae*							X						
Chilcothe, wild cucumber	*Marah macrocarpus*	X	X	X	X			X		X		X		
Coast live oak	*Quercus agrifolia*	X	X	X	X	X	X	X	X	X	X		X	X
Cobweb thistle	*Cirsium occidentale*			X				X	X	X			X	X
Common Fiddleneck	*Amsinckia menzesii* var. *intermedia*	X	X			X	X	X		X			X	
Common ice plant	*Mesembryanthemum crystallinum*						X	X						
Common reed	*Phragmites australis*			X			X			X				
Coulter pine (ornamental)	*Pinus coulteri*						X							
Coyote brush	*Baccharis pilularis*	X		X	X	X		X	X	X		X	X	X
Crimson fountaingrass	*Pennisetum setaceum*			X			X	X	X		X			
Curly dock	*Rumex crispus*									X			X	
Deer weed	*Acmispon glaber*		X	X	X		X	X	X	X		X	X	X
Feltleaf ceanothus	*Ceanothus arboreus*						X						X	X
Fremont's cottonwood	*Populus fremontii*												X	

APPENDIX C

Plant Species Identified During April 2008 and May 2009 Surveys of RFI Areas on NASA-Administered Property at SSFL

Common Name	Scientific Name	Group 2 Sites					Group 3 Sites						Group 9 Sites	
		LOX	Landfill	ELV	Ash Pile	B515 STP	Alfa	Bravo	ABFF	SPA	B204	WCT	R2 Ponds	CDFF
Fringed Indian pink	*Silene lacinata*								X					
Golden yarrow	*Eriophyllum confertiflorum*												X	X
Hoary-leaf ceanothus	*Ceanothus crassifolia*	X	X	X				X				X		
Holly-leaved cherry	***Prunus ilicifolia***	X												
Holly-leaved redberry	*Rhamnus ilicifolia*												X	X
Honeysuckle	*Lonicera hispidula*						X							
Italian thistle	*Carduus pycnocephalus*			X										
Laurel sumac	*Malosma laurina*	X	X	X	X	X	X	X	X	X	X	X	X	X
Leafy daisy, fleabane	*Erigeron foliosus*												X	
Lotus	*Lotus hamatus*			X				X			X			
Manzanita	*Arctostaphylos* sp.			X				X						
Mexican fan palm	*Washingtonia robusta*								X				X	
Milk thistle	*Silybum marianum*		X	X	X	X	X	X	X	X	X			X
Mugwort	*Artemesia douglasiana*								X	X			X	X
Mulefat	*Baccharis salicifolia*	X				X	X	X		X	X	X	X	X
Narrow-leaved milkweed	*Asclepias fascicularis*												X	X
Narrow-leaved willow	*Salix exigua*						X							
Peach (ornamental)	*Prunus* sp.						X							

APPENDIX C

Plant Species Identified During April 2008 and May 2009 Surveys of RFI Areas on NASA-Administered Property at SSFL

Common Name	Scientific Name	Group 2 Sites					Group 3 Sites						Group 9 Sites	
		LOX	Landfill	ELV	Ash Pile	B515 STP	Alfa	Bravo	ABFF	SPA	B204	WCT	R2 Ponds	CDFF
Perennial ryegrass	*Lolium perenne*									X				
Peruvian pepper tree	***Schinus molle***	X												
Pitcher sage, hummingbird sage	*Salvia spathacea*									X				
Poison oak	*Toxicodendron diversilobum*	X		X	X	X		X	X	X			X	X
Popcorn flower	*Plagiobothrys* spp.					X	X	X	X	X	X	X		
Prickly lettuce	*Lactuca serriola*						X	X						
Prickly sow thistle	*Sonchus asper* spp. *asper*		X				X			X	X			X
Purple needlegrass	*Nassella pulchra*			X	X		X						X	
Purple nightshade	*Solanum xanti*	X	X	X		X			X	X		X		X
Purple sage	*Salvia leucophylla*					X	X	X			X	X		
Rabbitsfoot grass, annual beard grass	*Polypogon monspeliensis*									X			X	X
Red brome	*Bromus madritensis* ssp. *rubens*	X	X	X	X	X	X	X	X	X	X	X	X	X
Red willow	*Salix laevigata*						X	X	X	X			X	X
Red-stem filaree	*Erodium cicutarium*	X	X		X	X		X	X	X	X		X	X
Ripgut brome	*Bromus diandrus*	X		X	X	X	X	X	X	X	X		X	X
Rock cress	*Arabis sparsiflora* var. *californica*												X	

APPENDIX C

Plant Species Identified During April 2008 and May 2009 Surveys of RFI Areas on NASA-Administered Property at SSFL

Common Name	Scientific Name	Group 2 Sites					Group 3 Sites						Group 9 Sites	
		LOX	Landfill	ELV	Ash Pile	B515 STP	Alfa	Bravo	ABFF	SPA	B204	WCT	R2 Ponds	CDFF
Salt cedar	*Tamarix chinensis*			X										
Santa Susana tarplant	***Deinandra minthornii***	X	X	X	X	X	X	X	X	X	X	X	X	X
Scarlet pimpernel	*Anagallis arvensis*											X		
Shortpod mustard	*Hirschfeldia incana*	X	X	X	X	X	X	X	X	X	X	X	X	X
Silver carpet, California aster	*Lessingia filagnifolia*	X	X				X	X		X			X	
Slender wild oats	*Avena barbata*		X	X	X		X	X	X		X			
Smilo grass	*Piptatherum miliaceum*												X	
Soap plant, Amole	*Chloragalum pomeridianum*						X							
Soft chess	*Bromus hordeaceus*	X							X			X	X	
Sticky monkeyflower	*Mimulus longiflorus*			X				X		X	X		X	X
Stinging lupine	*Lupinus hirsutissimus*							X						
Sweet fennel	*Foeniculum vulgare*												X	
Telegraph weed	*Heterotheca grandiflora*			X		X	X	X	X	X				
Thickleaf yerba santa	*Eriodictyon crassifolia*	X	X	X	X	X	X	X	X	X	X	X	X	X
Tocalote, yellow star thistle	*Centaurea melitensis*			X			X		X	X	X	X	X	X
Tree tobacco	*Nicotiana glauca*			X			X	X			X		X	X
Tree-of-heaven	*Ailanthus altissima*									X				

APPENDIX C

Plant Species Identified During April 2008 and May 2009 Surveys of RFI Areas on NASA-Administered Property at SSFL

Common Name	Scientific Name	Group 2 Sites					Group 3 Sites						Group 9 Sites	
		LOX	Landfill	ELV	Ash Pile	B515 STP	Alfa	Bravo	ABFF	SPA	B204	WCT	R2 Ponds	CDFF
White sage	*Salvia apiana*												X	
White snapdragon	*Antirrhinum coulterianum*												X	
Wild barley	*Hordeum murinum*						X						X	X
Wild morning glory	*Calystegia macrostegia*						X		X			X		
Wild oats	*Avena fatua*												X	X
Wild peony	*Paeonia californica*								X	X				
Winter vetch	*Vicia villosa*		X	X	X	X				X	X		X	X
Yellow sweetclover	*Melilotus indica*	X	X	X	X	X	X	X	X	X	X	X	X	X
Notes:														
1. Group 2 and 3 sites were surveyed in April 2008; Group 3 sites were surveyed in May 2009.														
2. Plants in boldface were sighted during the Fall 2010 survey only.														
3. Non-chalky species of *Dudleya* were sighted outside RFI areas during the Fall 2010 survey (not listed in table).														

Appendix D
Survey Photographs

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Photo 1 Coyote brush (*Baccharis pilularis*) scrub at HWSA Site

Photo 2 Coast live oak riparian forest

Photo 3 Coast live oak woodland underlain by non-native grassland

Photo 4 Mosaic of non-native grassland, chaparral, sage scrub, and rock outcrop

Photo 5 Non-native grassland with dove weed and telegraph weed

Photo 6 Non-native grassland (eroded) on rock outcrop slope

Photo 7 Non-native grassland adjacent to coast live oak woodland

Photo 8 Disturbed (previously burned) sage scrub near Coca Site pond

Photo 9 Sage scrub southeast of Coca Site

Photo 10 Mosaic of chaparral, sage scrub, and rock outcrop

Photo 11 Southern willow scrub south of Alfa Site along base of rock slope

Photo 12 Southern willow scrub adjacent to Coca Site pond

Photo 13 Undifferentiated wetland dominated by common reed

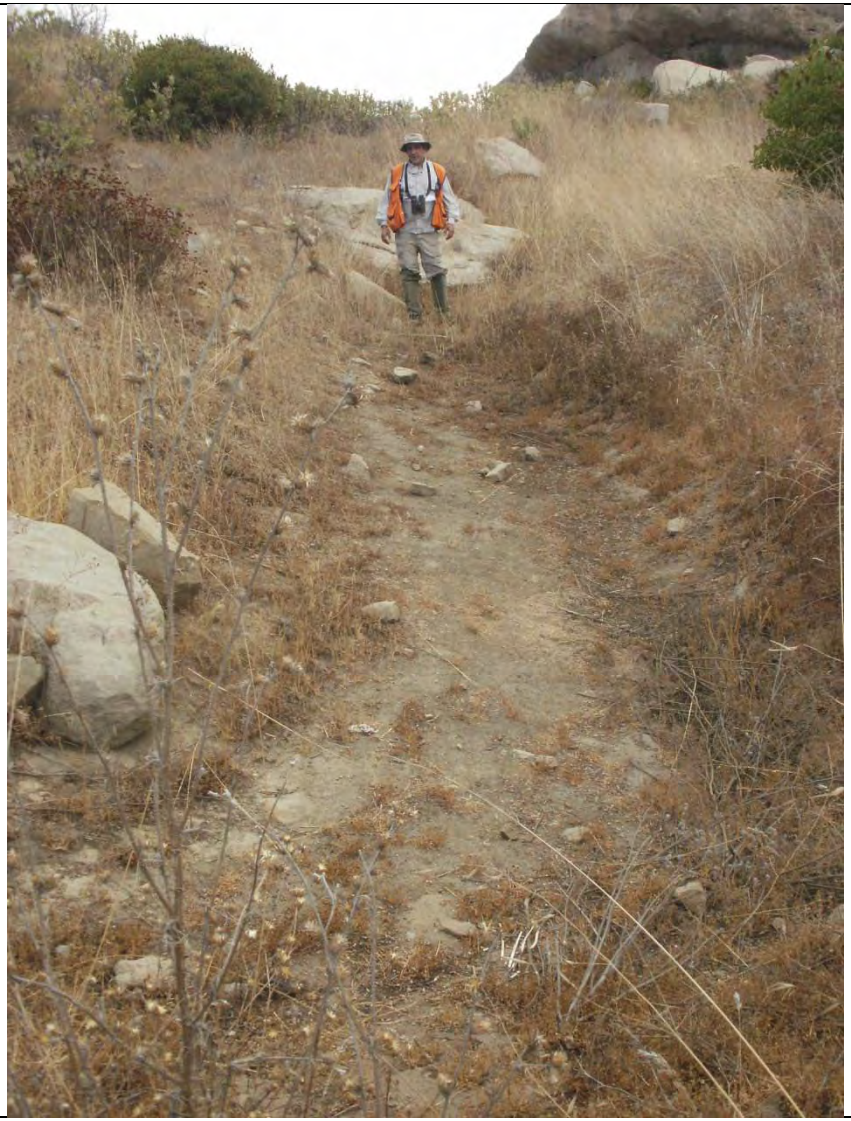

Photo 14 Wetland basin with cocklebur (*Xanthium* sp.) in foreground

Photo 15 Temporary ponded area between rock outcrops

Photo 16 Open water habitat at R-2 Pond

Photo 17 Open water habitat at Coca Site

Photo 18 Capped LOX Site

Photo 19 Appearance of Braunton's milk-vetch at time of surveys

Photo 20 Appearance of Santa Susana tarplant at time of surveys

Photo 21 Non-chalky *Dudleya* sp.

Photo 22 Chalky *Dudleya* sp.

Photo 23 Typical north-facing rock slope habitat where *Dudleya* sp. was found

Photo 24 Eroded grassland rock slope habitat where *Dudleya* sp. was found

Photo 25 Mule deer buck rub in Area II

Photo 26 Western rattlesnake in Area II

Photo 27 Basin 01

Photo 28 Basin 03 (contains water)

Photo 29 Series of rock basins

Photo 30 Green heron in Area II

Photo 31 Possible raptor cliff nest north of LOX Site in Area I

Photo 32 Whitewash and prey remains below possible raptor cliff nest

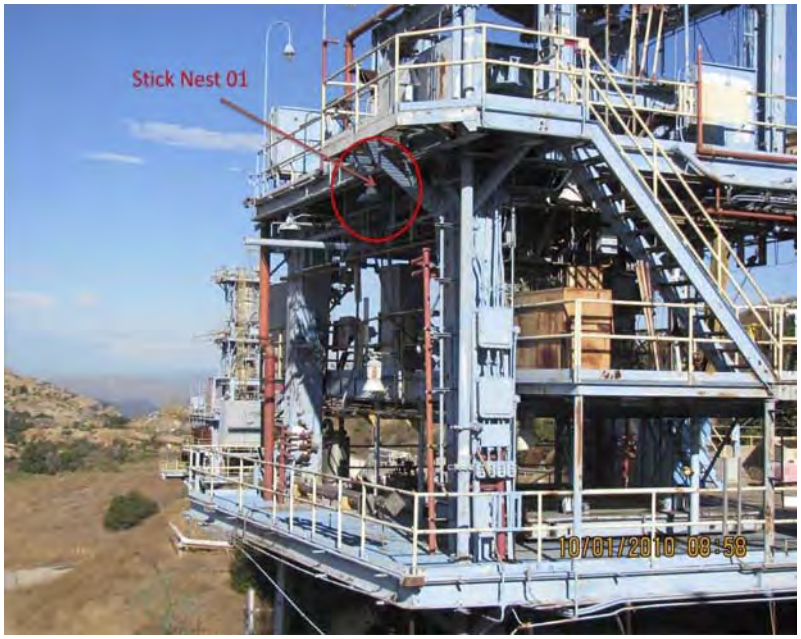

Photo 33 Stick Nest 01 on structure in Alfa Site

Photo 34 Stick Nest 01 close up

Photo 35 Stick Nest 02 on cliff south of Alfa Site

Photo 36 Stick Nest 02 close up

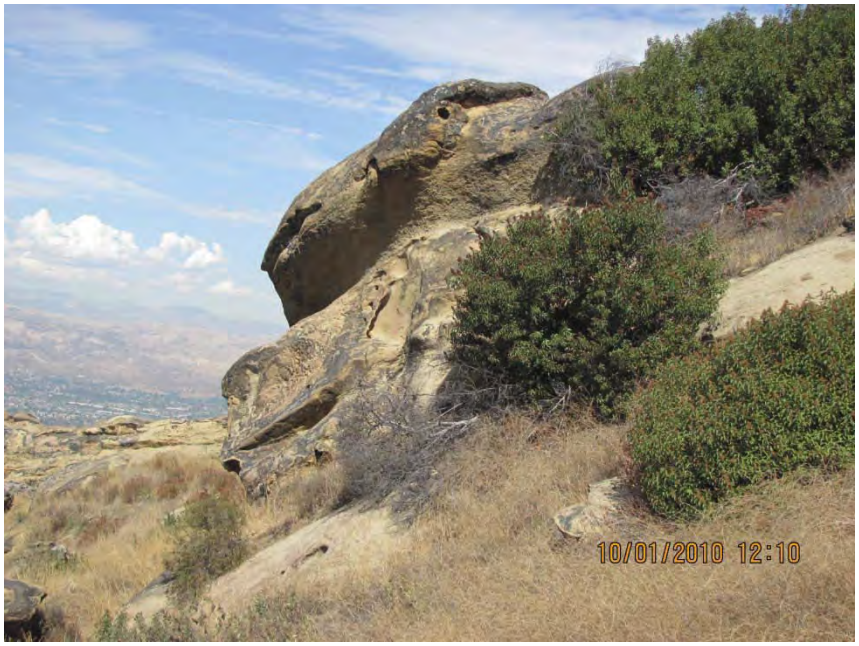	
Photo 37 Stick Nest 03 southwest of Alfa Site	Photo 38 Stick Nest 03 close up

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Appendix E
Species of Interest Mapping

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Legend

CNDDB March 2008

- Santa Susana tarplant
- Braunton's milk-vetch
- many-stemmed dudleya
- slender mariposa-lily
- Plummer's mariposa-lily
- Blochman's dudleya
- western spadefoot
- arroyo toad
- western mastiff bat
- San Diego desert woodrat
- tricolored blackbird
- Southern Sycamore Alder Riparian Woodland
- Southern Coast Live Oak Riparian Forest
- Plant (80m)
- Plant (specific)
- Plant (non-specific)
- Plant (circular)
- Animal (80m)
- Animal (specific)
- Animal (non-specific)
- Animal (circular)
- Terrestrial Community (80m)
- Terrestrial Community (specific)
- Terrestrial Community (non-specific)
- Terrestrial Community (circular)
- RFI Sites
- RFI Groups

California Dept. of Fish and Game, California Natural Diversity Database (CNDDB), March 2008

0 3,000 Feet

N

southern California rufous-crowned sparrow

Plummer's mariposa-lily

western spadefoot

San Diego desert woodrat

western mastiff bat

San Fernando Valley spineflower

uthern Sycamore Alder Riparian Woodland

Santa Susana tarplant

tricolored blackbird

Blochman's dudleya

Braunton's milk-vetch

slender mariposa-lily

many-stemmed dudleya

Southern Coast Live Oak Riparian Forest

arroyo toad

pallid bat

golden eagle

chaparral nolina

California leaf-nosed bat

E-1
CNDDB Data (March 2008)
NASA Habitat Survey - Fall 2010
Santa Susana Field Laboratory
Ventura County, California

SAC \\ZION\SACGIS\PROJ\343638_SIMIVALLEYEAST\MAPFILES\CNDDB_11X17.MXD CNDDB_11X17.PDF SSCOPES 8/7/2008 14:49:41

Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SensitiveSpecies_South.mxd) ES012111042614TPA

Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SensitiveSpecies_North.mxd)

N
W E
S

0 100 200 400 600 800 Feet

19-NOV-2010
Drawn By:
A. Cooley

Legend
Pond
SWMU or AOC
NASA Property Boundary

E-4
NASA Habitat Survey - Fall 2010
Santa Susana Field Laboratory
Ventura County, California

Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SensitiveSpecies_AI.mxd)

Appendix F
Santa Susana Tarplant Mapping

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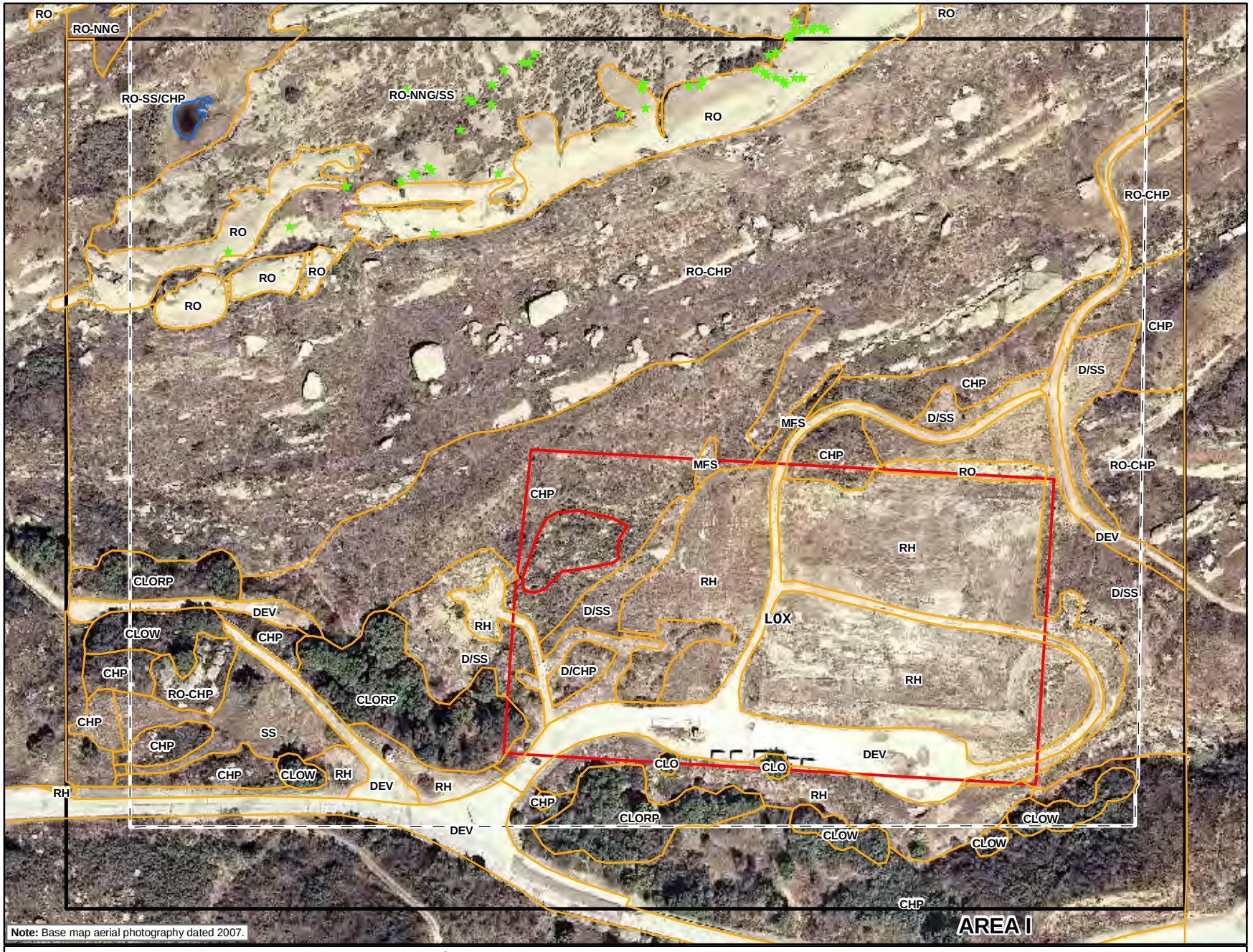


Note: Base map aerial photography dated 2007.

15-NOV-2010
Drawn By:
A. Cooley

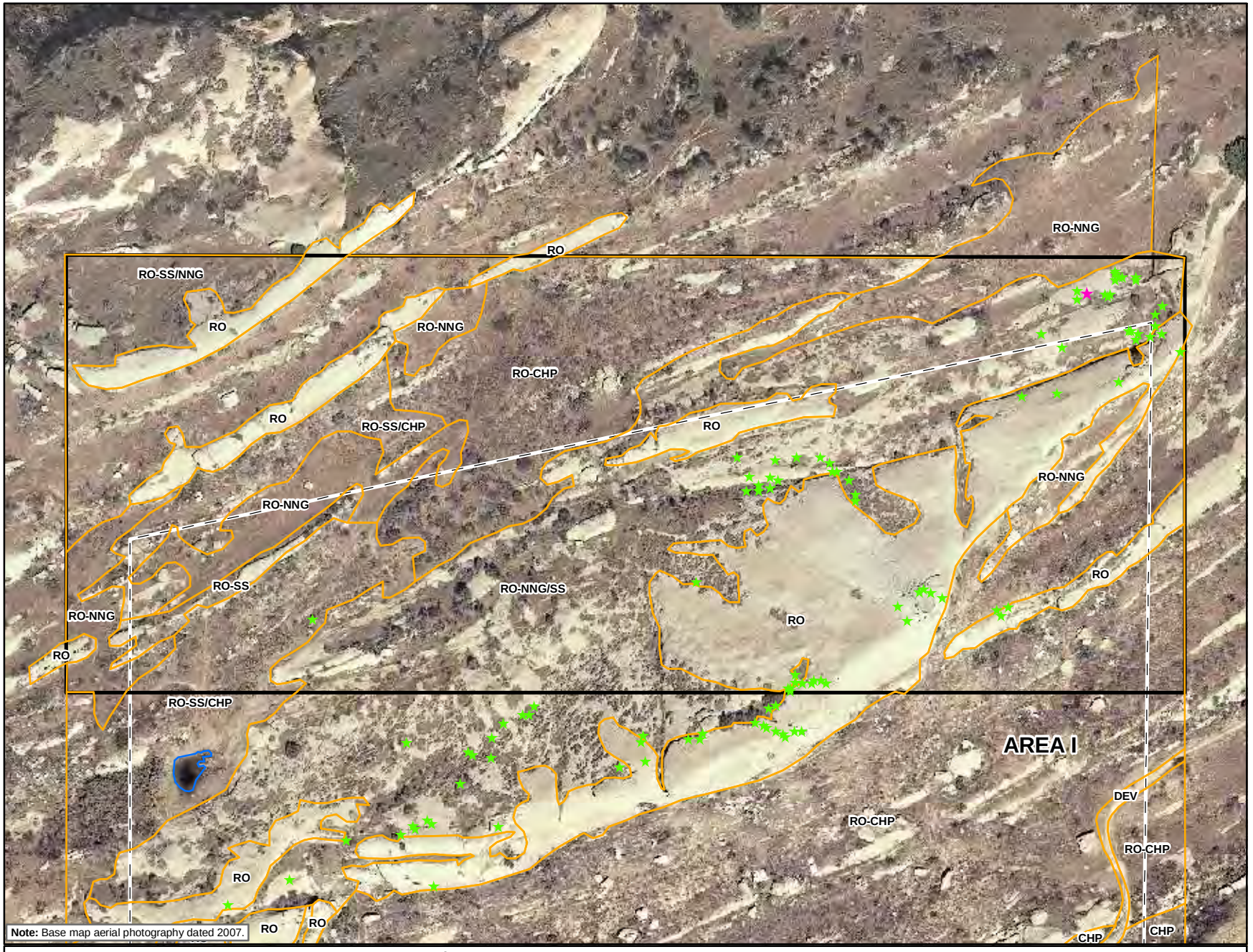
0 25 50 100 150 200 Feet

Legend

- 11-40 Santa Susana Tarplants
- 6-10 Santa Susana Tarplants
- 1-5 Santa Susana Tarplants
- Grid
- Pond
- SWMU or AOC
- NASA Property Boundary

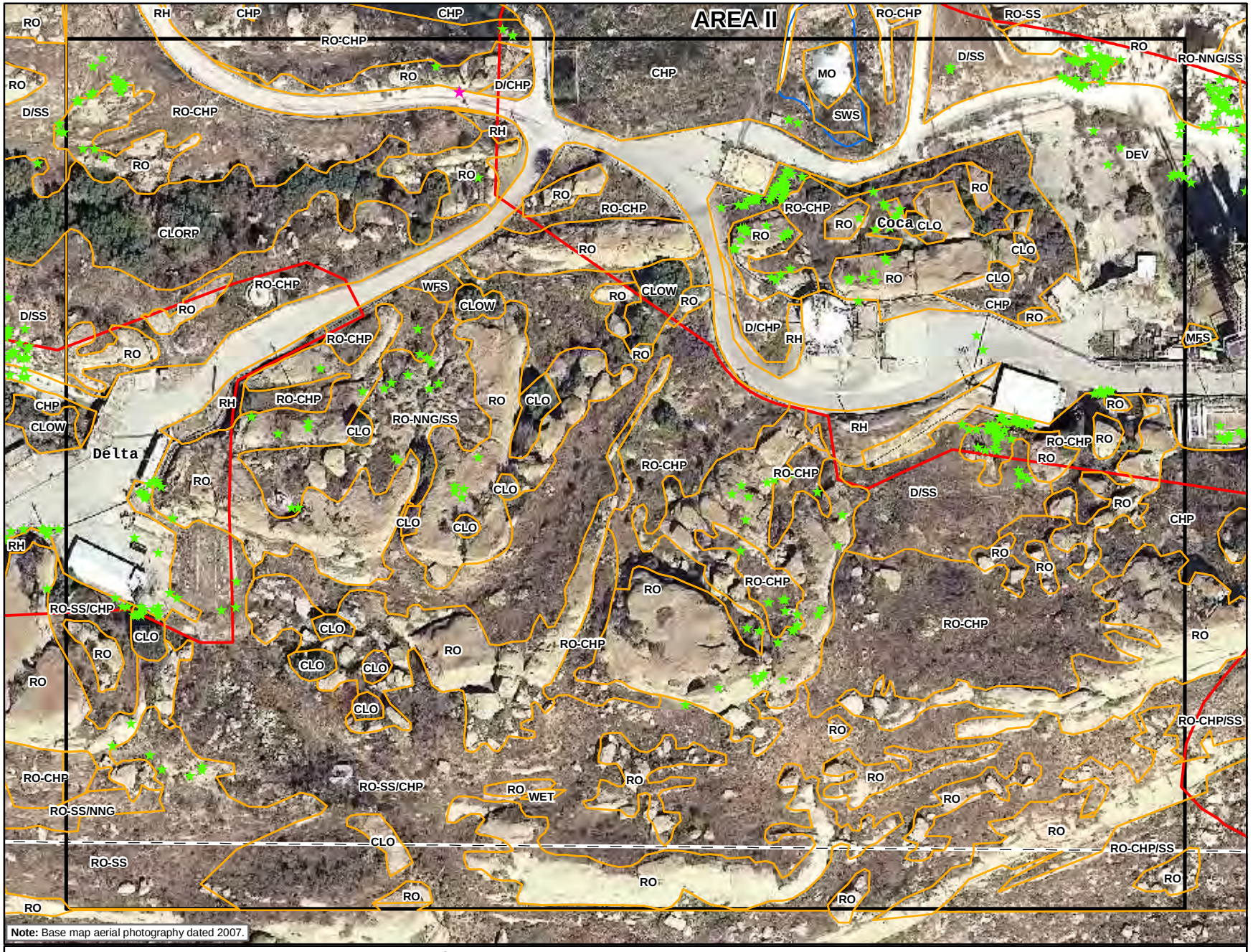
A1-1
NASA Habitat Survey - Fall 2010
Santa Susana Field Laboratory
Ventura County, California

Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A1-1.mxd)



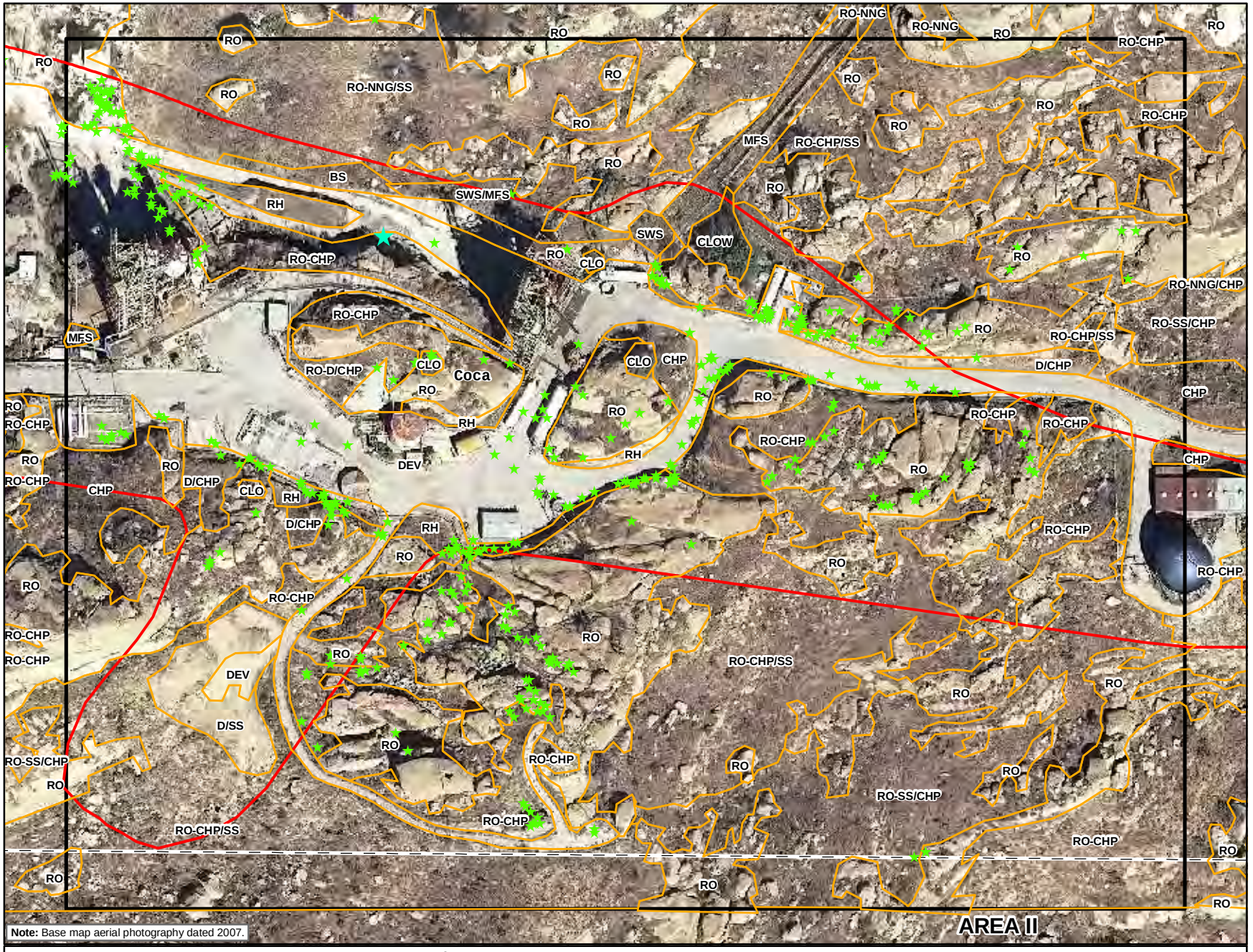
Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A1-2.mxd)

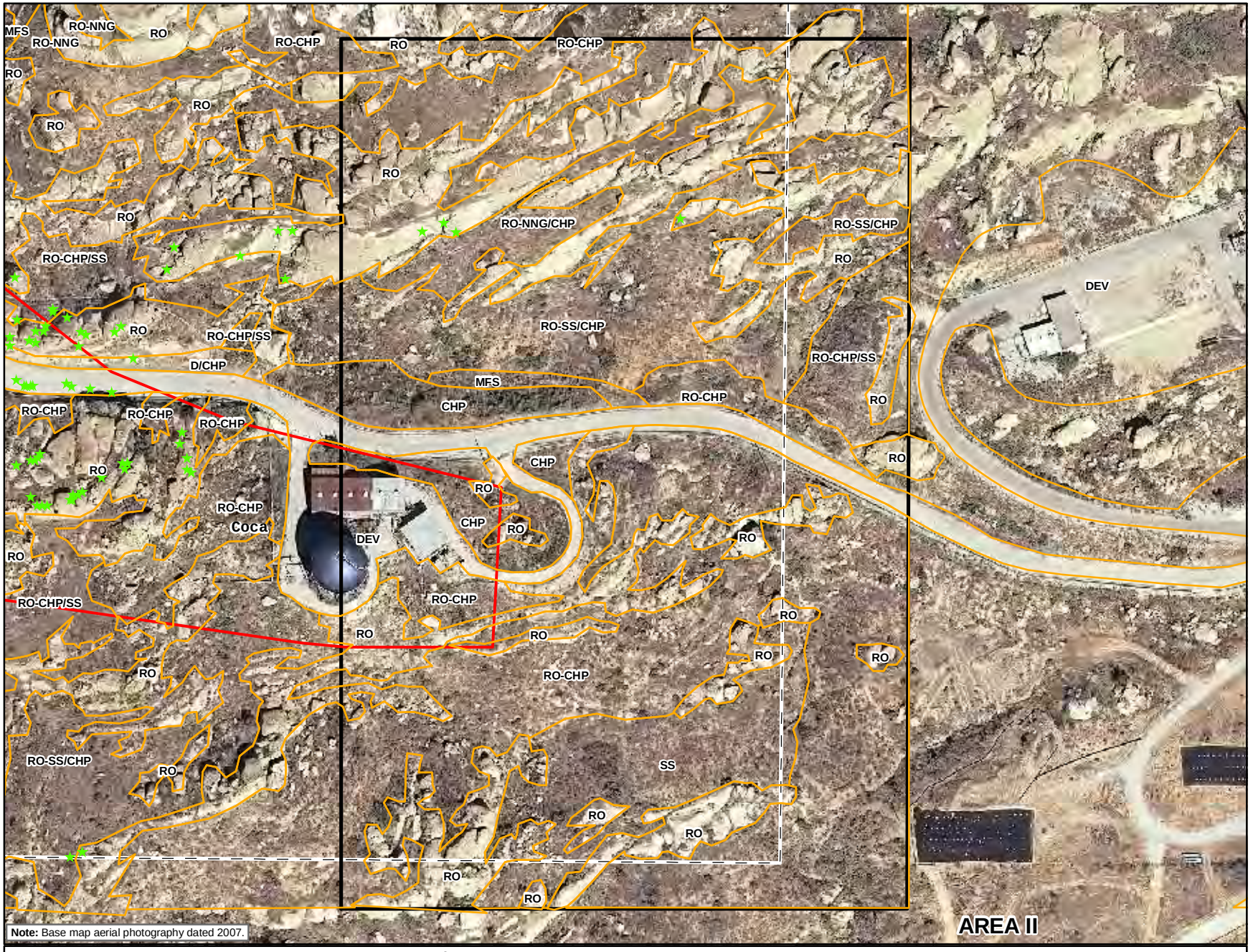

AREA II
PLF
R-2A and R2B Ponds
Delta
Note: Base map aerial photography dated 2007.
10-NOV-2010
Drawn By:
A. Cooley
0 25 50 100 150 200
Feet
Legend
11-40 Santa Susana Tarplants
6-10 Santa Susana Tarplants
1-5 Santa Susana Tarplants
Grid
Pond
SWMU or AOC
NASA Property Boundary
A2-1
NASA Habitat Survey - Fall 2010
Santa Susana Field Laboratory
Ventura County, California
Map Document:(O:\NASA\SSFL\maps\EcologicalSurvey\SSFL_SSTarplant_A2-1.mxd)

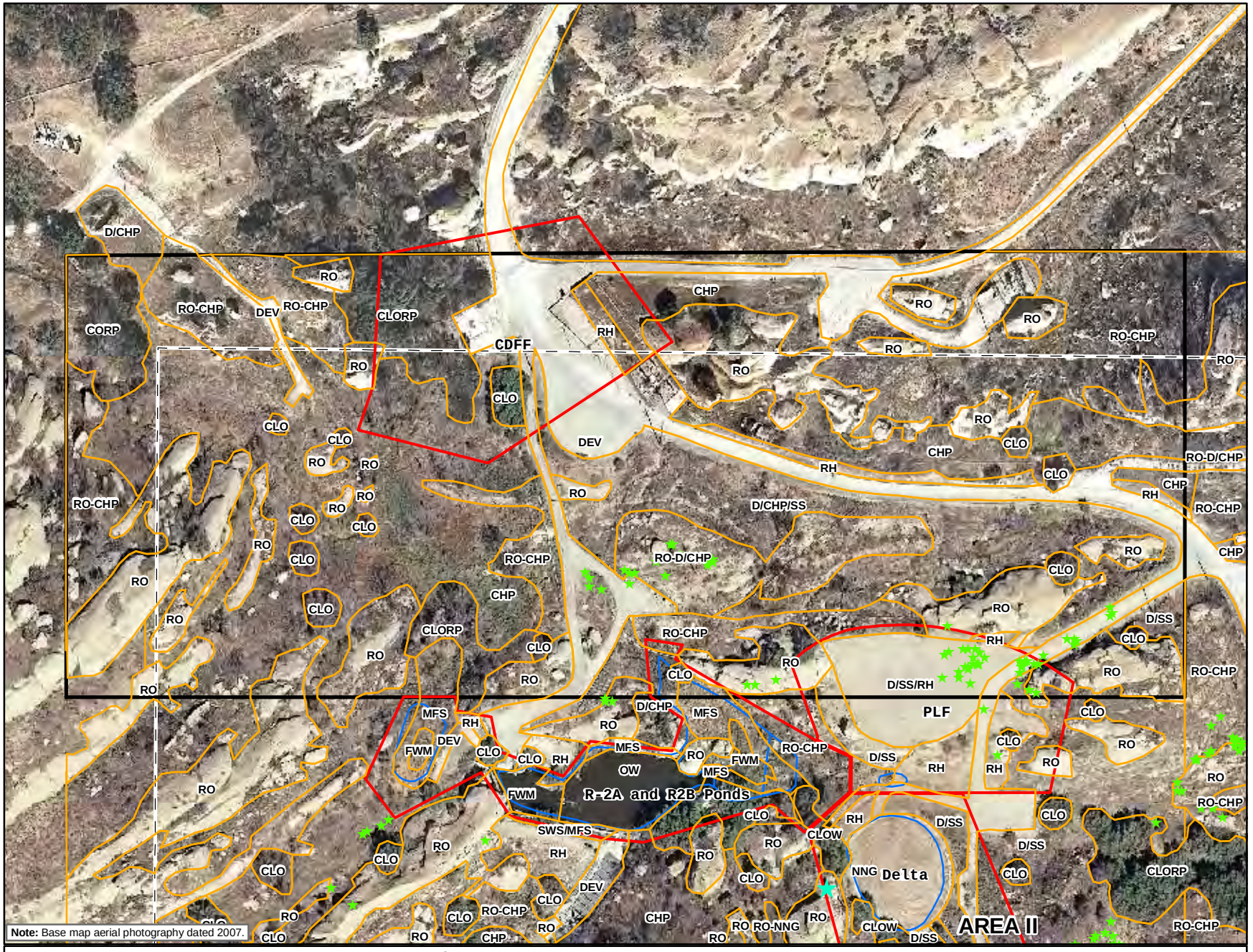


A2-2
NASA Habitat Survey - Fall 2010
Santa Susana Field Laboratory
Ventura County, California

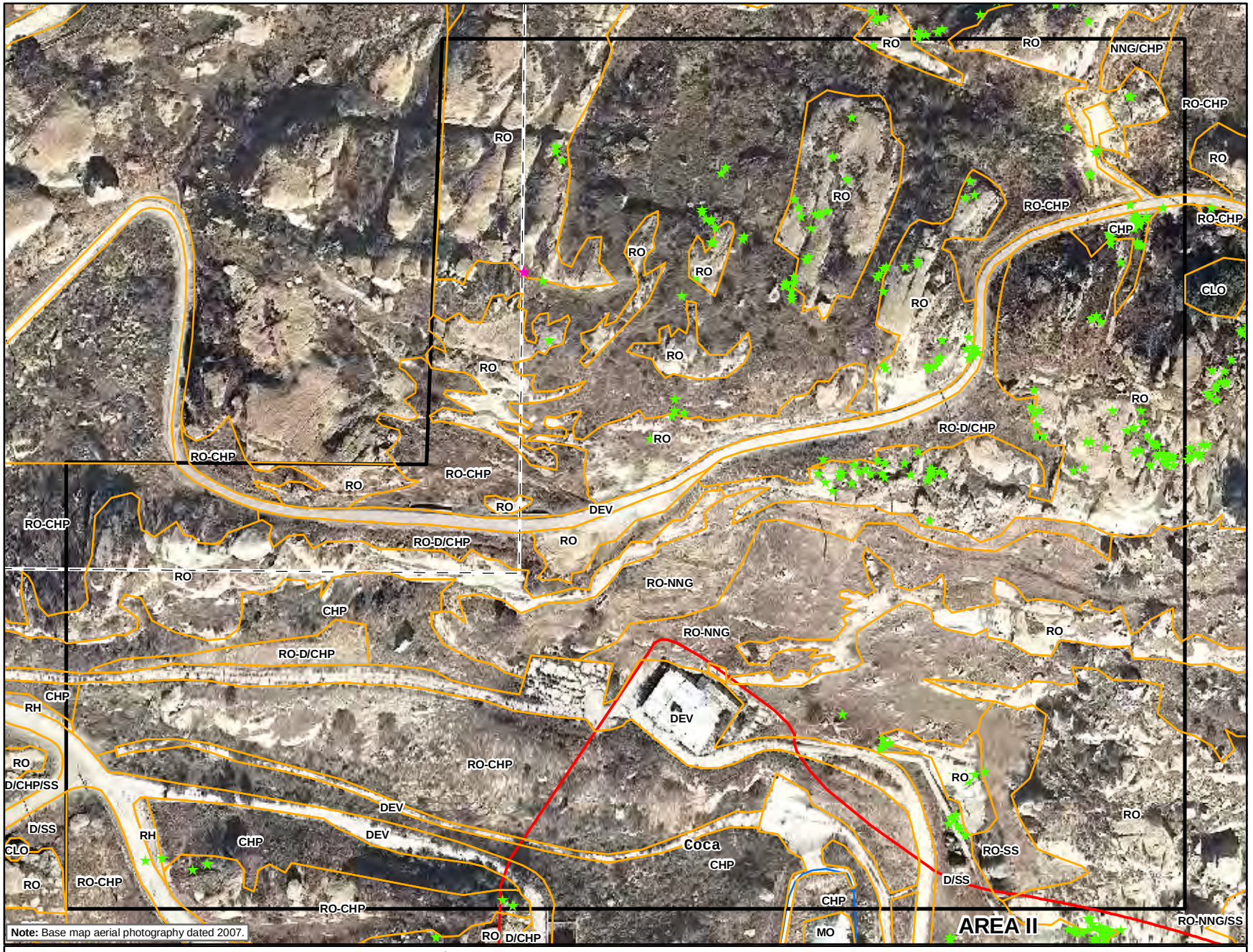
Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-2.mxd)


RO
RO-NNG
RO-NNG/SS
RO-CHP
RO-CHP/SS
RO-NNG/CHP
RO-SS/CHP
RO-D/CHP
MFS
BS
SWS/MFS
SWS
CLOW
CLO
CHP
D/CHP
RH
DEV
D/SS
Coca
AREA II
Note: Base map aerial photography dated 2007.
15-NOV-2010
Drawn By:
A. Cooley
0 25 50 100 150 200
Feet
Legend
11-40 Santa Susana Tarplants
6-10 Santa Susana Tarplants
1-5 Santa Susana Tarplants
Grid
Pond
SWMU or AOC
NASA Property Boundary
A2-3
NASA Habitat Survey - Fall 2010
Santa Susana Field Laboratory
Ventura County, California
Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-3.mxd)


MFS
RO-NNG
RO
RO-CHP
RO-NNG/CHP
RO-SS/CHP
RO-CHP/SS
D/CHP
CHP
MFS
DEV
Coca
SS
AREA II
Note: Base map aerial photography dated 2007.
15-NOV-2010
Drawn By:
A. Cooley
0 25 50 100 150 200
Feet
Legend
11-40 Santa Susana Tarplants
6-10 Santa Susana Tarplants
1-5 Santa Susana Tarplants
Grid
Pond
SWMU or AOC
NASA Property Boundary
A2-4
NASA Habitat Survey - Fall 2010
Santa Susana Field Laboratory
Ventura County, California
Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-4.mxd)



Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-5.mxd)



15-NOV-2010
Drawn By:
A. Cooley

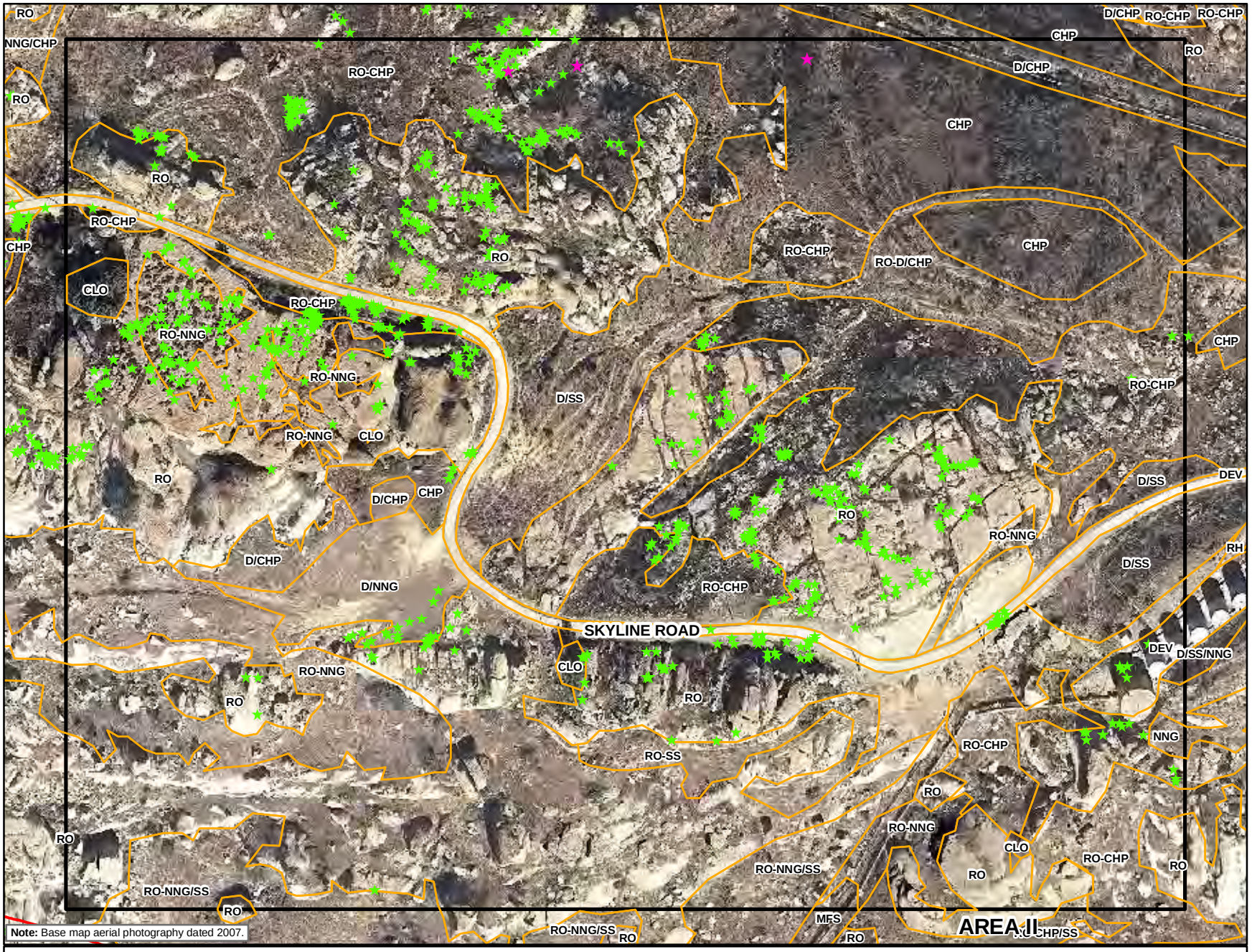
0 25 50 100 150 200 Feet

Legend

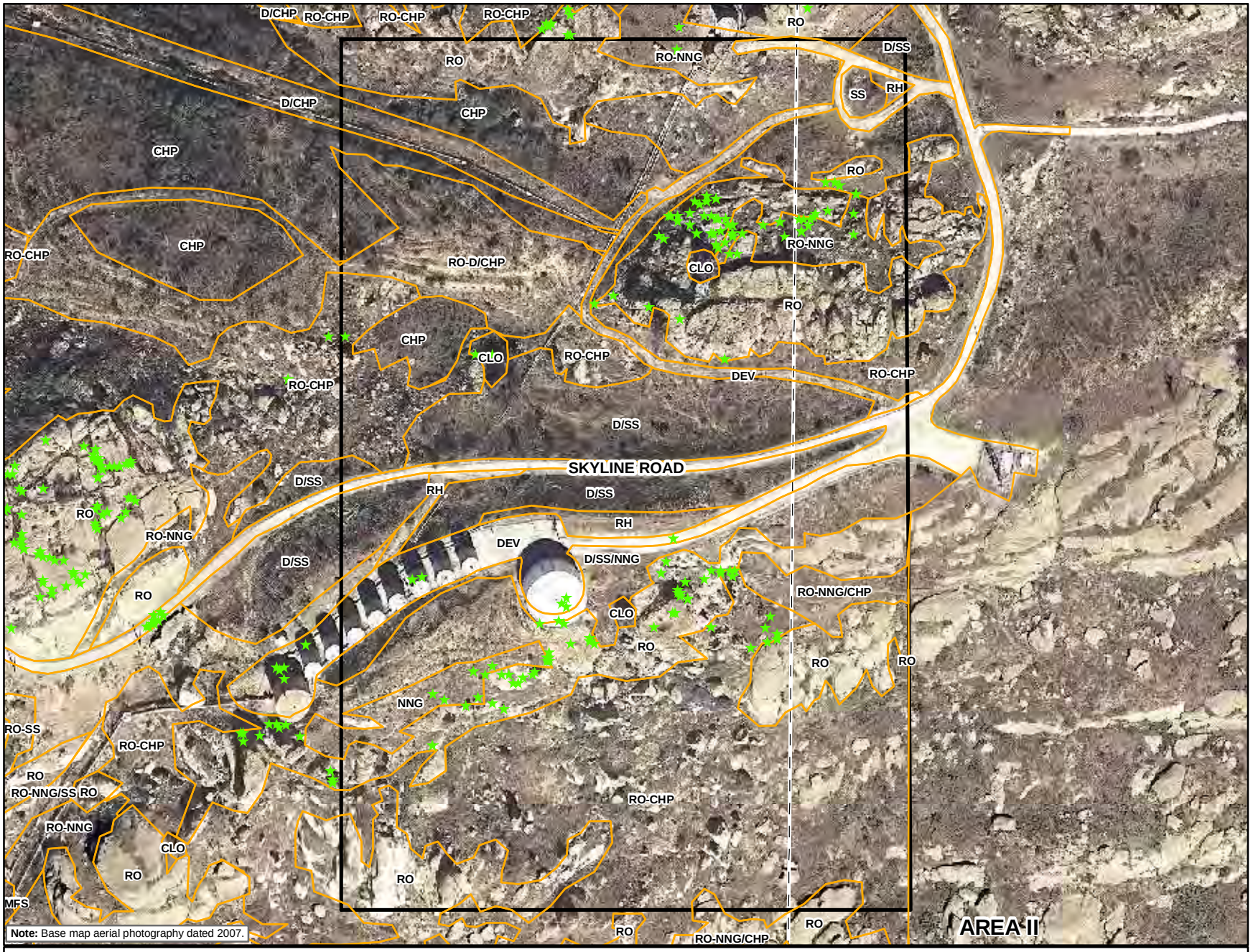
- 11-40 Santa Susana Tarplants
- 6-10 Santa Susana Tarplants
- 1-5 Santa Susana Tarplants
- Grid
- Pond
- SWMU or AOC
- NASA Property Boundary

A2-6
NASA Habitat Survey - Fall 2010
Santa Susana Field Laboratory
Ventura County, California

Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-6.mxd)



Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-7.mxd)



15-NOV-2010
Drawn By:
A. Cooley

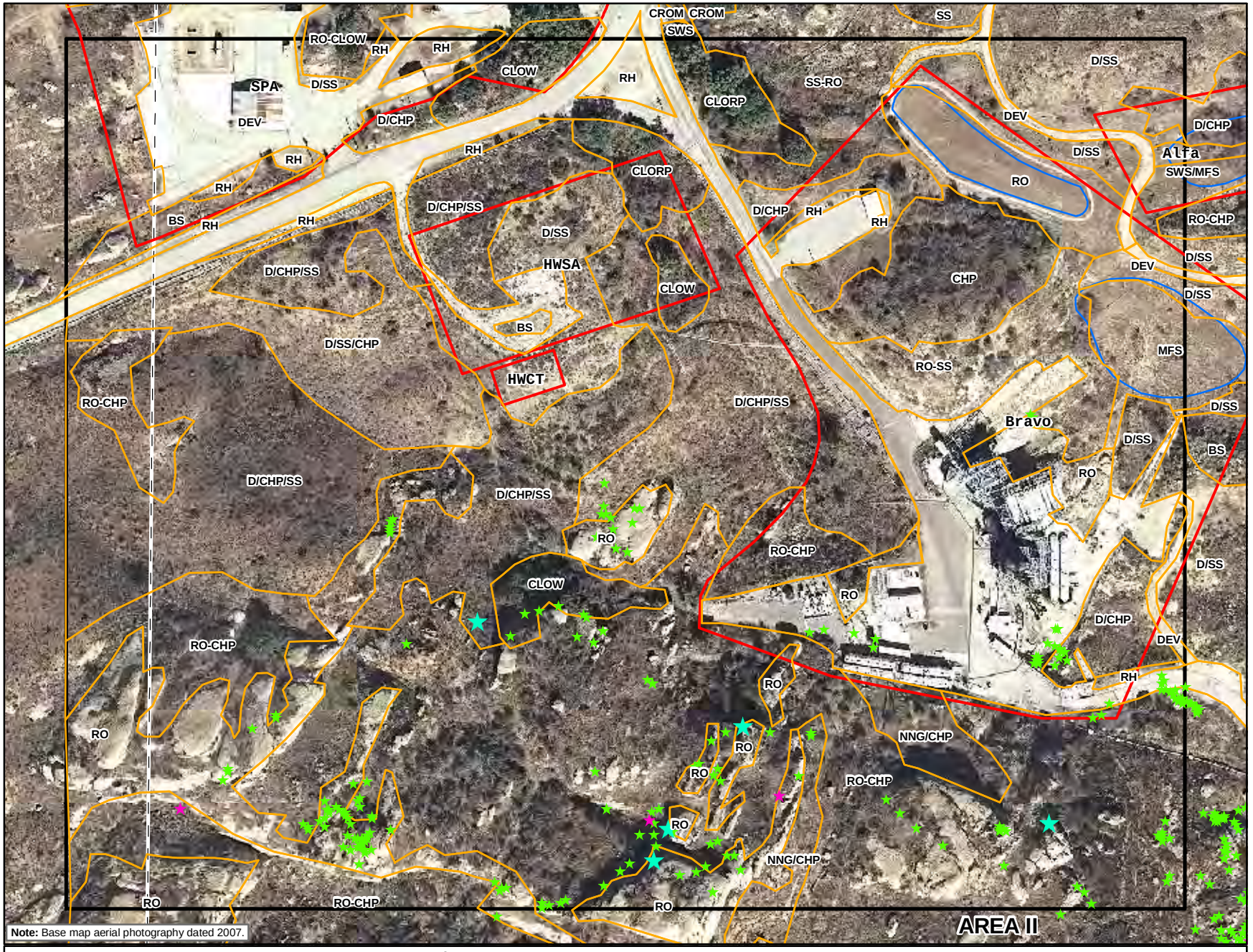
0 25 50 100 150 200 Feet

Legend

- 11-40 Santa Susana Tarplants
- 6-10 Santa Susana Tarplants
- 1-5 Santa Susana Tarplants
- Grid
- Pond
- SWMU or AOC
- NASA Property Boundary

A2-8
NASA Habitat Survey - Fall 2010
Santa Susana Field Laboratory
Ventura County, California

Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-8.mxd)



Note: Base map aerial photography dated 2007.

15-NOV-2010
Drawn By:
A. Cooley

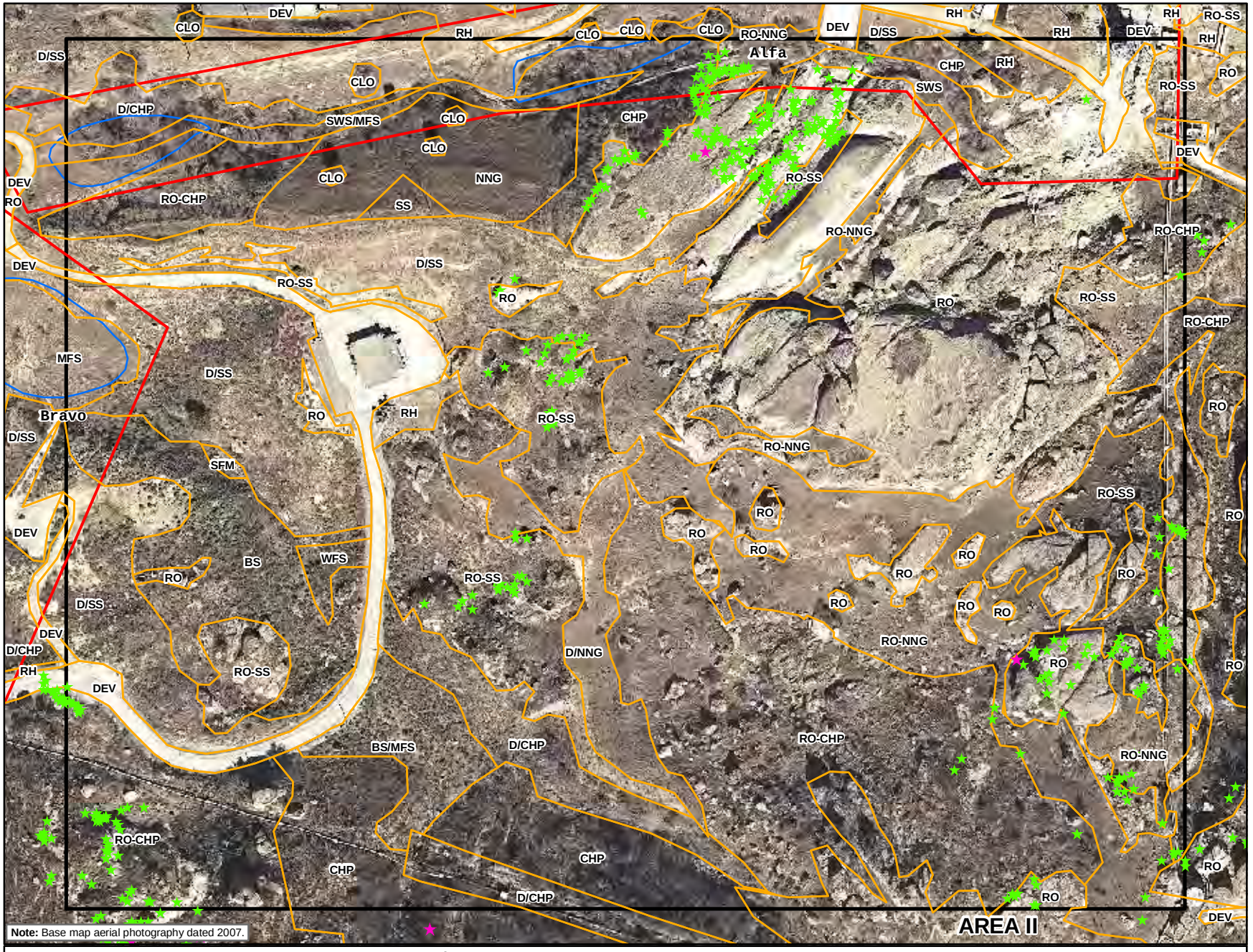
0 25 50 100 150 200 Feet

Legend

- 11-40 Santa Susana Tarplants
- 6-10 Santa Susana Tarplants
- 1-5 Santa Susana Tarplants
- Grid
- Pond
- SWMU or AOC
- NASA Property Boundary

A2-9
NASA Habitat Survey - Fall 2010
Santa Susana Field Laboratory
Ventura County, California

Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-9.mxd)



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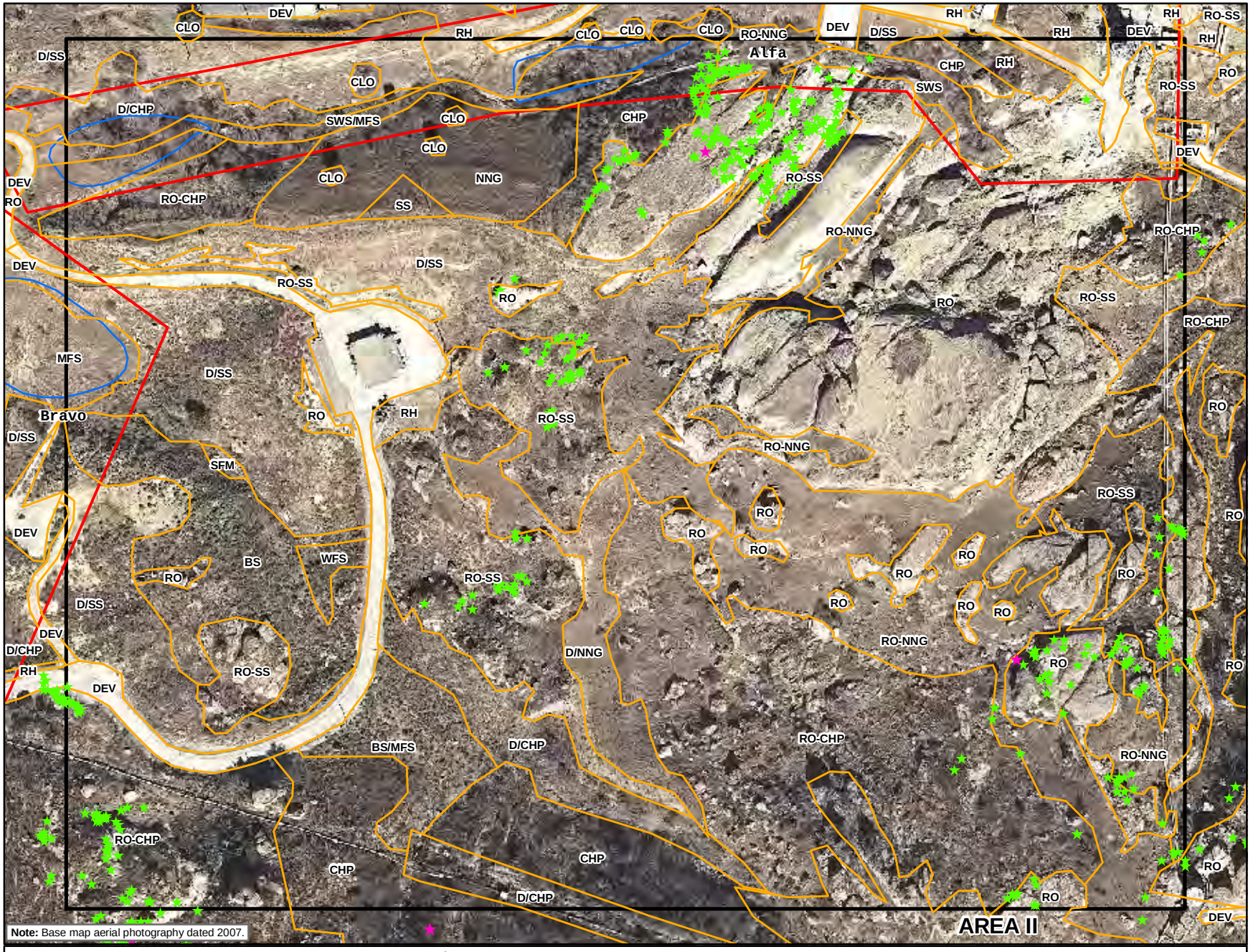

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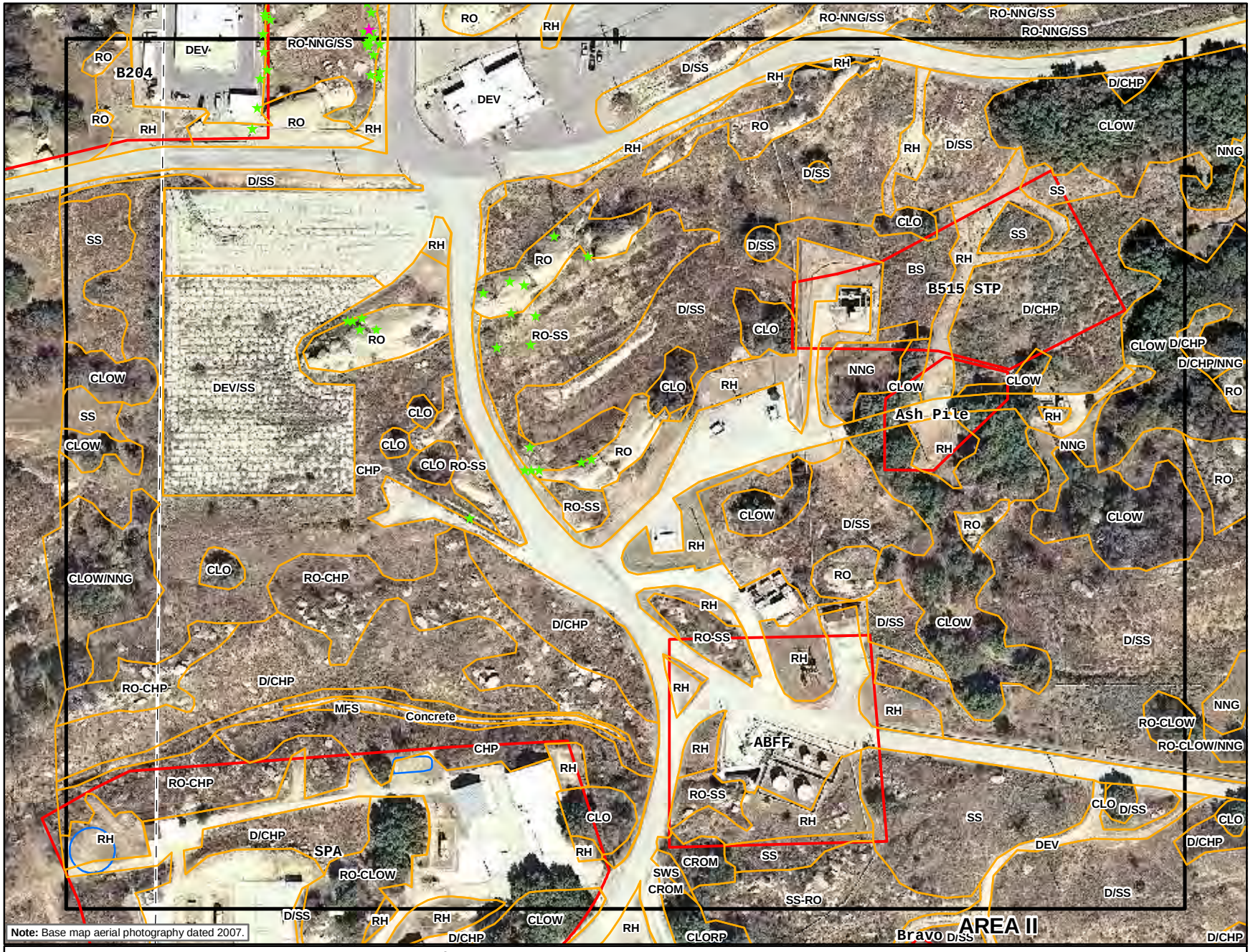


15-NOV-2010
Drawn By:
A. Cooley

0 25 50 100 150 200 Feet

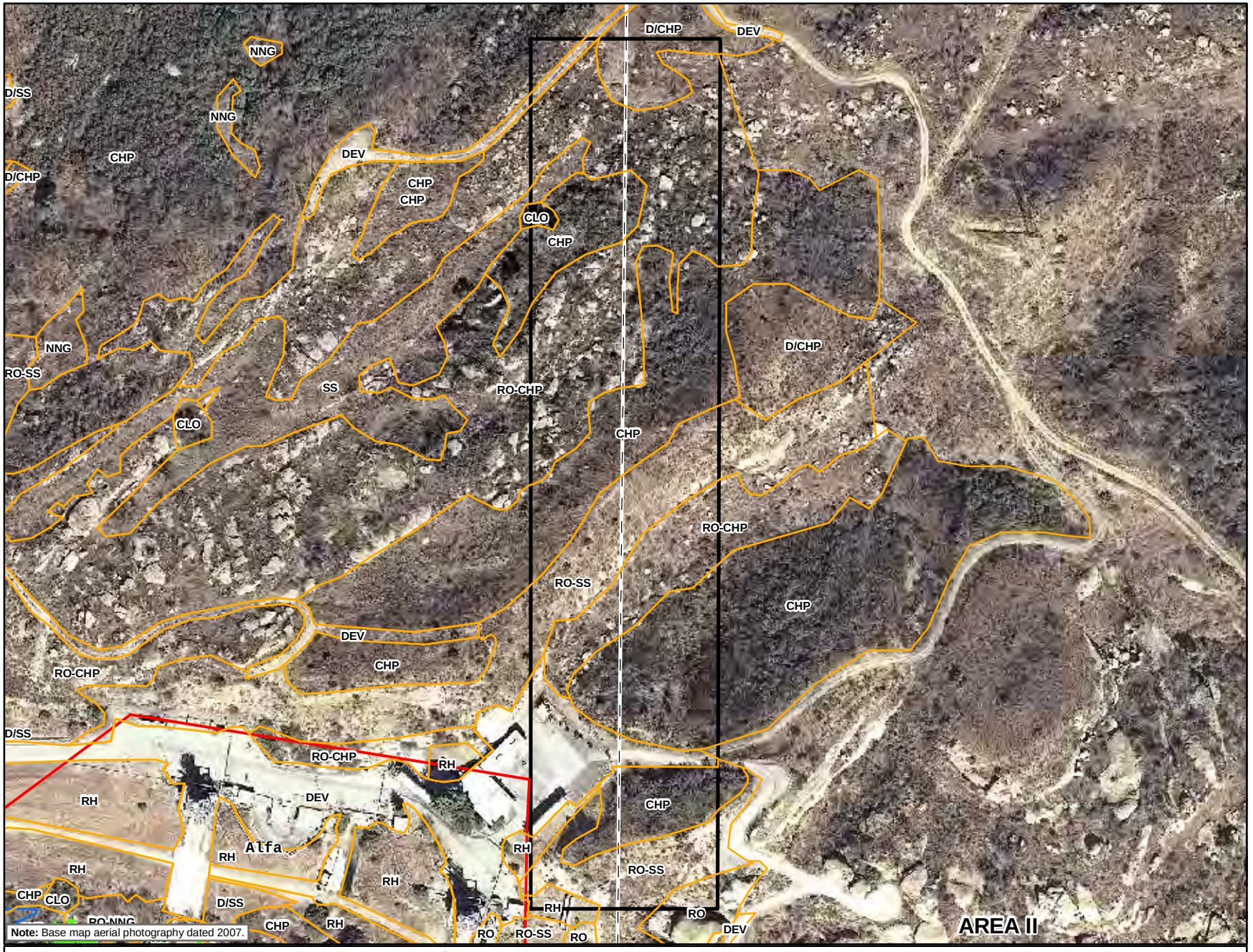
Legend

- 11-40 Santa Susana Tarplants
- 6-10 Santa Susana Tarplants
- 1-5 Santa Susana Tarplants
- Grid
- Pond
- SWMU or AOC
- NASA Property Boundary

A2-12
NASA Habitat Survey - Fall 2010
Santa Susana Field Laboratory
Ventura County, California

Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-12.mxd)

Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-13.mxd)



15-NOV-2010
Drawn By:
A. Cooley

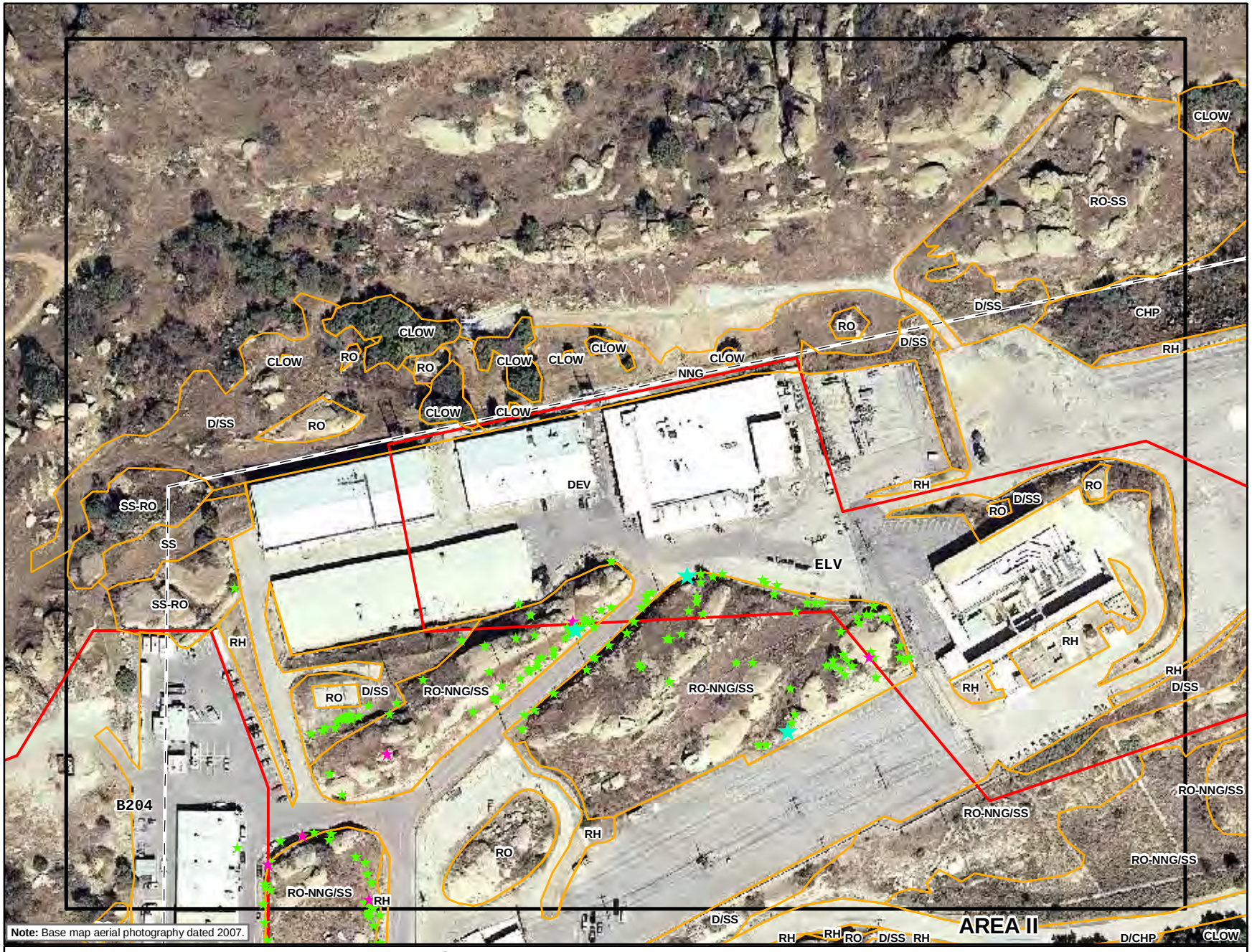
0 25 50 100 150 200 Feet

Legend

- 11-40 Santa Susana Tarplants
- 6-10 Santa Susana Tarplants
- 1-5 Santa Susana Tarplants
- Grid
- Pond
- SWMU or AOC
- NASA Property Boundary

A2-14
NASA Habitat Survey - Fall 2010
Santa Susana Field Laboratory
Ventura County, California

Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-14.mxd)



15-NOV-2010
Drawn By:
A. Cooley

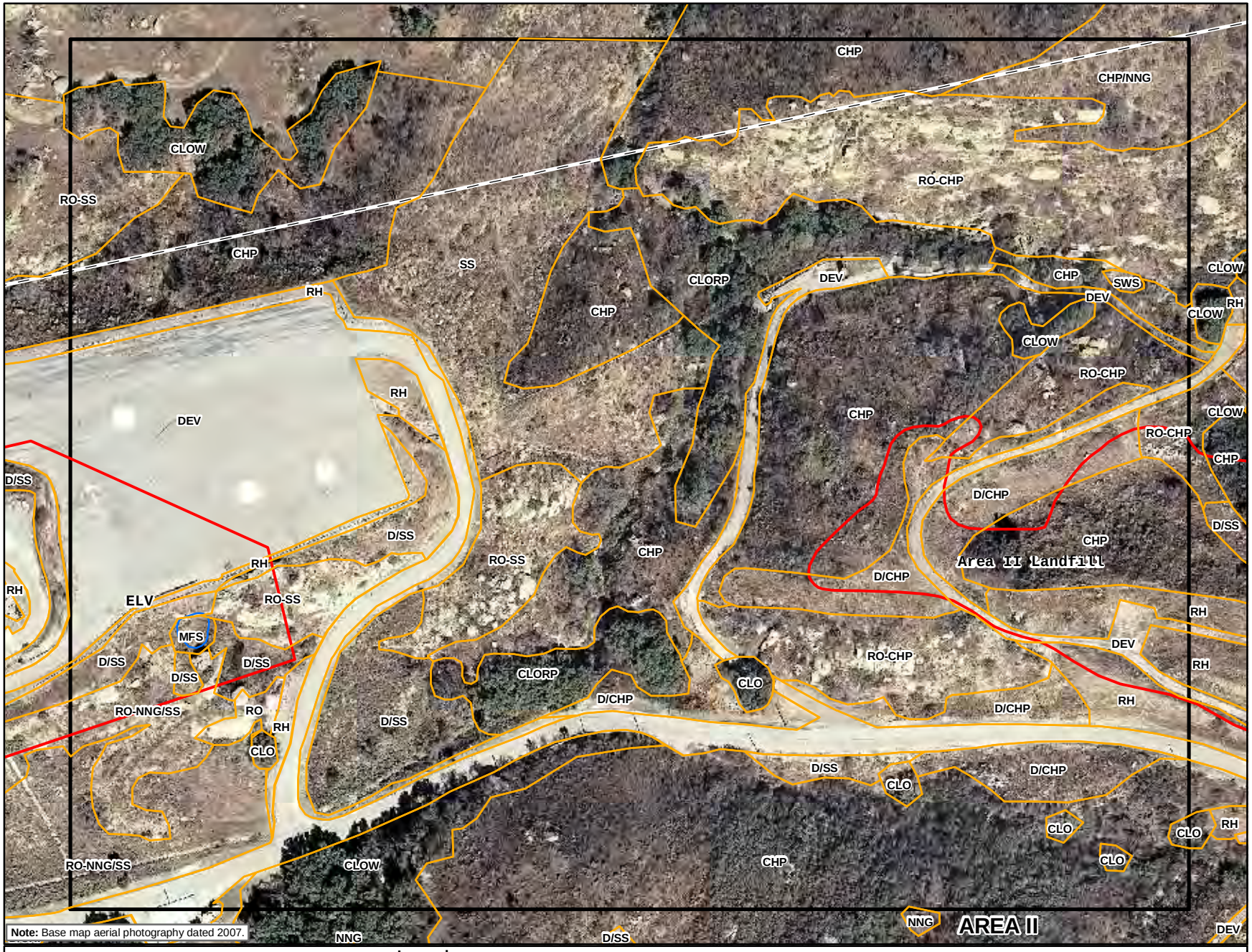
0 25 50 100 150 200 Feet

Legend

- 11-40 Santa Susana Tarplants
- 6-10 Santa Susana Tarplants
- 1-5 Santa Susana Tarplants
- Grid
- Pond
- SWMU or AOC
- NASA Property Boundary

A2-15
NASA Habitat Survey - Fall 2010
Santa Susana Field Laboratory
Ventura County, California

Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-15.mxd)



Note: Base map aerial photography dated 2007.

15-NOV-2010
Drawn By:
A. Cooley

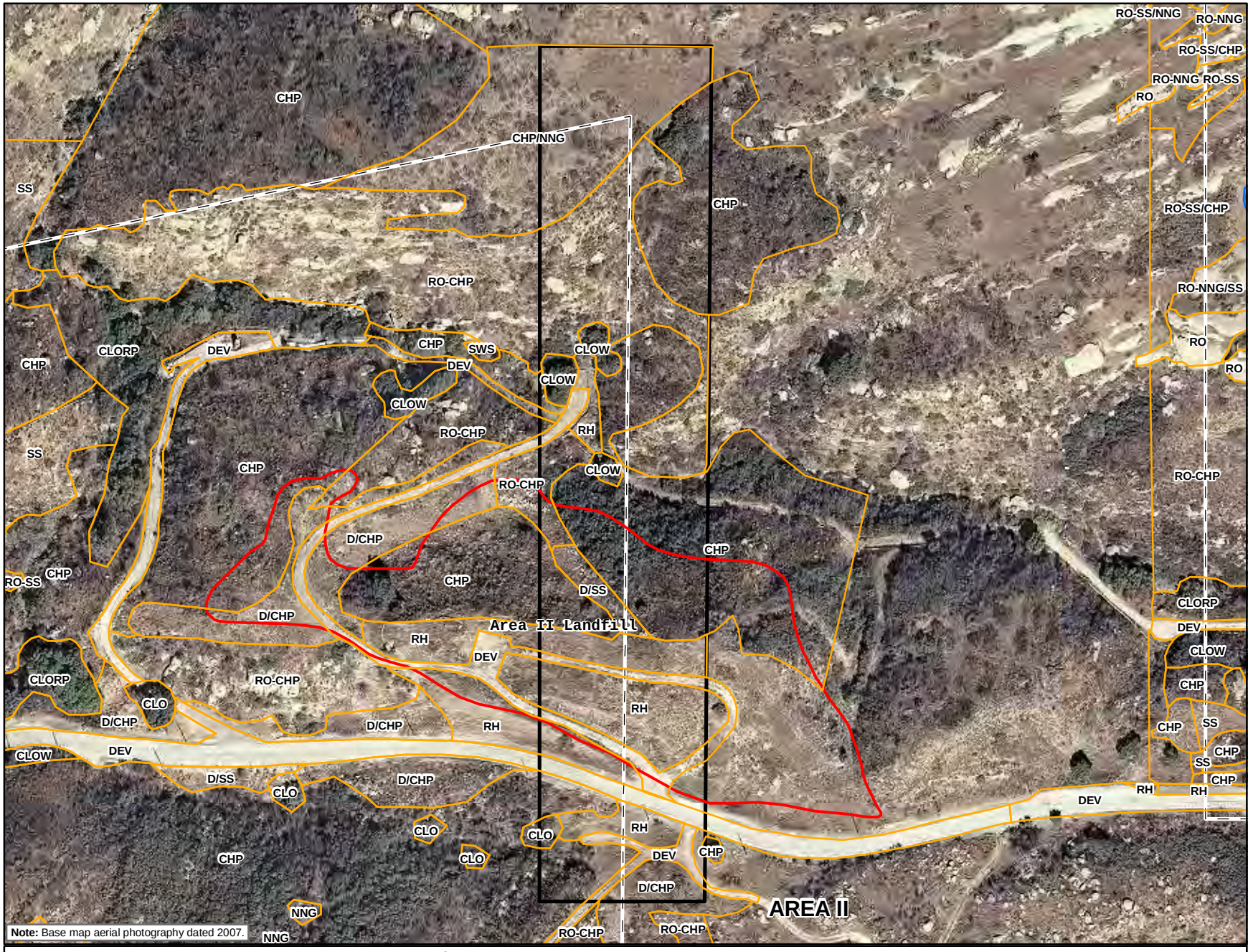
0 25 50 100 150 200 Feet

Legend

- 11-40 Santa Susana Tarplants
- 6-10 Santa Susana Tarplants
- 1-5 Santa Susana Tarplants
- Grid
- Pond
- SWMU or AOC
- NASA Property Boundary

A2-16
NASA Habitat Survey - Fall 2010
Santa Susana Field Laboratory
Ventura County, California

Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-16.mxd)



Map Document: (O:\NASA\SSFL\maps\EcologicalSurvey2010\SSFL_SSTarplant_A2-17.mxd)

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Appendix G
Species of Interest Datasheets

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NASA Santa Susana Field Laboratory
Species of Interest Observation Form

Species: Santa Susana tarplant

ID#: ST01

Lat/Long: 34°13'22.3"/118°41'08.9"

Date: 09/28/2010

Investigators: S. Long; G. Santolo

Associated NC Datasheet ID: None

Population size: 1 individual

Community Type: RO CHP

Photos: Attached

Habitat Description: Mid-slope up rock outcrop on sandy seam

Adjacent Disturbances: None apparent

Notes:

Accumulations in sandy rock seams where Santa Susana tarplant was observed.

NASA Santa Susana Field Laboratory
Species of Interest Observation Form

Species: Santa Susana tarplant

ID#: ST14

Lat/Long: 34°13'26.5"/118°41'07.0"

Date: 09/28/2010

Investigators: S. Long; G. Santolo

Associated NC Datasheet ID: RO northeast corner

Population size: ST03 – ST25 (22 individuals)

Community Type: RO

Photos: Attached

Habitat Description: Rock outcrop, sandstone, northern aspect

Adjacent Disturbances: Hiking trails in area, litter observed

Notes:

Rock outcrop, sandstone where Santa Susana tarplants were observed.

NASA Santa Susana Field Laboratory
Species of Interest Observation Form

Species: Dudleya (*parva*?)

ID#: Dud801

Lat/Long: 34°13'29.6"/118°42'15.9"

Date: 10/08/2010

Investigators: S. Long; G. Santolo

Associated NC Datasheet ID: RO-NNG

Population size: 12 plants within a 15-foot (5-meter) radius

Community Type: Rock outcrop-non-native grassland Photos: Attached

Habitat Description: Patchy remnants of soil and NNG spread over exposed rock slope (sandstone); aspect is NW; slope approximately 22°; soil is bound with moss and lichen (biotic crust). Dominant vegetation: *Avena* sp. (oat), *Bromus madritensis* ssp. *rubens* (red brome), *Bromus diandrus* (ripgut brome), *Yucca schidigera* (yucca), *Deinandra minthornii* (Santa Susana tarplant)

Adjacent Disturbances: Erosion of rock slope

Notes: Small mammal burrows in soil

Rock outcrop-non-native grassland where dudleya were observed.

NASA Santa Susana Field Laboratory
Species of Interest Observation Form

Species: Coast horned lizard

ID#: HL01

Lat/Long: 34°14'23.6"/118°41'11.1"

Date: 9/29/2010

Investigators: S. Long; G. Santolo

Associated NC Datasheet ID: RO- NE corner

Population size: 1 individual – juvenile about 1.5 inches

Community Type: RO

Photos: None

Habitat Description: In sandy accumulations within rock outcrop undulations, hidden beneath Santa Susana tarplant ST 110

Adjacent Disturbances: None apparent

Notes:

NASA Santa Susana Field Laboratory
Species of Interest Observation Form

Species: Coast horned lizard

ID#: HL02

Lat/Long: 34°14'13.9"/118°41'34.9"

Date: 9/29/2010

Investigators: S. Long; G. Santolo

Associated NC Datasheet ID: RH801

Population size: 1 individual – juvenile about 1 inch

Community Type: Ruderal Habitat

Photos: Attached

Habitat Description: Gravelly roadway on landfill

Adjacent Disturbances: Yes, vehicle access roadways and nearby monitoring well (PZ-134) about 30 feet west.

Notes: Lizard about 1 inch long

Coast horned lizard

NASA Santa Susana Field Laboratory
Species of Interest Observation Form

Species: Quino checkerspot butterfly (possible)

ID#: QCB 01

Lat/Long: 34°13'49.3"/118°41'58.6"

Date: 10/04/2010

Investigators: S. Long; G. Santolo

Associated NC Datasheet ID: RO- NNG

Population size: 1 individual

Community Type: RO NNG SS

Photos: Habitat only

Habitat Description: Tall *Avena fatua*/red brome, chamise, laurel sumac, yerba santa, sage, branching phacelia, Santa Susana tarplant

Adjacent Disturbances: Area was previously burned

Notes: No apparent plantago species observed. Individual flew away quickly in a zig-zag pattern suggesting it was a male QCB.

Habitat where possible Quino checkerspot butterfly was observed.

End of Appendix D